Elderly Persons in an Institution:

A Description of their Behavioral Processes and Development

Inauguraldissertation
zur
Erlangung der Doktorwürde
vorgelegt
der
Philosophischen Fakultät
der Rheinischen Friedrich-Wilhelms-Universität
zu Bonn

von

Richard J. Mc Donald

aus
St. Louis, Missouri, USA

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ABSTRACT

The current study examined the relation between institutionalization and (a) behavior processes mediated by the central nervous system and (b) observations of the patients' ward functioning. The methodology consisted of delineating a population in a long-term care hospital by means of behavioral rating scales and psychometric tests. The sample consisted of 417 patients; their mean age was 79, and 80% were females. Cross-sectional and longitudinal design were employed. There were five evaluations during the two year study.

Patients who completed the psychometric tests (53% of the population), were functioning more competently in terms of sociability and performing activities of daily living. The psychometric test findings demonstrated that with advancing age there was a slowness in response and performance rate, but argued against the concept that as the complexity of the task increases there is a disproportionate slowing with age. It was concluded that the age-related differences were the result of impaired efficiency in initiating responses and not of impairment in triggering a decision and computing a response.

The longitudinal findings, and more so the psychometric test results, were largely a replica of the cross-sectional ones and hence, were interpreted in the same context. The composite picture indicated that the intervening months of institutional living were not detrimental to the well-being of the surviving sample. It was concluded that the longitudinal findings accurately reflected changes in those available for retesting, but should not be generalized to the rest of the sample.

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INTRODUCTION

Institutionalization reflects a radical change in a person's pattern of living, particularly the imposition of a lifestyle foreign to a previous way of existence. This process in conjunction with the anticipatory and initial adaptation phase induces detrimental effects on the physical and mental well-being of the residents. Cross-sectional and longitudinal studies have demonstrated this, i.e., in comparison with the elderly community population, the institutionalized elderly differ in their demographic profile and health status. Lacking, however, is empirical data concerning institutionalization and its consequences on processes mediated by the central nervous system (CNS) and on behavioral observations of general institutional functioning in relation to age and changes in behavior over time.

The current study proposes to investigate the relationship between institutionalization and some forms of behavior mediated by the CNS such as psychomotor, perceptual, and cognitive functions, and on behavioral observations of general institutional functioning. Emphasis is focused on age differences as well as changes in behavior over time on variables assessed by psychometric instruments and behavioral rating scales. Cross-sectional and longitudinal research designs are employed.

Before reviewing the pertinent literature addressing the process and effects of institutionalization, a general overview of the aging process is presented. This section first describes the elderly demographically, and then reports on the biologic, psychologic, and social aspects of "normal" aging. The second part of the chapter focuses on the area of institutionalization. It is concluded with the statement of the problem, purpose of

the study, definition of the variables and the formulation of assumptions and hypotheses. Following the introductory chapter are the methodology, results, and discussion chapters.

What is Aging

Aging is universal among human beings. It is generally considered to be a continuous process which begins at conception and ceases at death, a process in which the organism and its functions go through various states of development (Bischof, 1976). Aging, aging processes, or similar concepts used throughout this report will be referring mainly to the developmental stages and phases beginning with the age of 60, unless otherwise specified. The study of this process in all its aspects - biological, psychological, and sociological - is known as the science of gerontology. Interest in this field has increased immensely in the last decade and is amplified by the recent publications of the three handbooks of aging: The Handbook of the Biology of Aging (Finch & Hayflick, 1977); the Handbook of the Psychology of Aging (Birren & Schaie, 1977), and the Handbook of Aging and the Social Sciences (Binstock & Shanas, 1976).

When considering the many facets of aging, it seems desirable at the beginning to describe this population and to highlight some of the definitions and changes which reflect these three schools of thought. The following descriptions are meant neither to be complete nor to serve as a curriculum, but merely to reference some of the established and emerging knowledge in these various areas.

The Demographics of Aging

Aging, of course, begins with conception. The selection of age 65 for use as the demarcation between middle and old age appears to have its origin in the social legislation of Chancellor Otto von Bismarck in Germany in the 1880s. The age was and is used as a means for determining the point of retirement and/or the point of eligibility for various services available to the elderly.

Number of elderly. A significant increase in the proportion of older persons in the Federal Republic of Germany (FRG) and the United States of America (USA) has occurred during this century. At the beginning of the century the percentage of aged persons, 65 and above, was 5% in the FRG and 4% in the USA (Laslett, 1976). By 1975, that figure had increased in the FRG to 15% (over 9 million people aged 65 and over), and in the USA to 11% (over 23 million people aged 65 and over) (World Population Data Sheet, Population Reference Bureau (PRB) 1978). Further division of these age groups reveals that in the FRG 5.8 million were between the age of 70 and 80, and 1.4 million were over 80. In the USA the figures were 10.2 and 4.6 million, respectively (Statistisches Jahrbuch, 1977; U.S. Bureau of the Census Current Population Reports, 1975). These increases in the elderly population are characteristic of modern industrial societies in general (Laslett, 1976).

Life expectancy. This century has seen enormous gains in the average age to which Germans and Americans can expect to live. In 1900, life expectancy was 45 and 47 years, respectively. In 1977, the comparable numbers for

Germans were: males - 67.6 years; females - 72.6 years; for Americans: white males - 69.4 years, white females - 77.2 years (Statistisches Jahrbuch, 1979; U.S. Bureau of the Census, 1977). The gains in life expectancies are mainly attributed to new medical discoveries, improved health care, and reduced risk of death during the period of infancy through young adulthood. The life expectancy of persons who are already 65 years old is approximately 15 additional years.

Sex. A marked difference exists between the life expectancies of men and women. As indicated above, women outlive men, and this advantage has widened over time. The sex ratio of women to men at ages 65-74 was 1.5 to 1 and 1.3 to 1; at ages 75-84 was 2 to 1 and 1.7 to 1 and at 85 and older 2.4 to 1 and 2.2 to 1 for the FRG and USA, respectively. Reasons for these sex variances are partially explained by biological factors, reduced maternal mortality rates, and certain male occupations, e.g., back-breaking physical labor (Department of Health, Education and Welfare (HED), U.S. Bureau of the Census, 1977; Statistisches Jahrbuch, 1979).

Marital status. Table 1 presents the respective distributions of older Germans and Americans. A comparison of the two countries indicates that the ratio is fairly uniform between the two. If anything, slightly more female Germans were single. It is clear that most elderly men are married, whereas the majority of elderly women are widows. This difference, due to a combination of the greater female life expectancy plus the fact that most women are younger than their husbands to begin with, represents one of the most poignant problems of the aged (Bulter & Lewis, 1977).

Living arrangements. The old, like the young, live in a variety of households. As inferred by the marital status distribution, the vast majority of elderly men are married and living with a spouse, while many elderly females are living alone. Statistics on Americans reveal that 75% of men and 35% of women live with their spouse. An additional 7% of men live in another's household and 23% of women live in this manner. Approximately 14% of men and 35% of women live alone. For both sex groups this percentage increases with age. Residential patterns of American females have shown a substantial shift in the last 10 years; before, 33% lived in the household of another person (U.S. Bureau of the Census, 1970). Very few old people live in institutions. In the FRG the percentage is around three to four percent (Dittrich, 1972), and in the USA five percent (Siegel, 1976). Statistics on elderly Germans indicate that similar living arrangements exist (Fülgraff, 1978). Like Americans, more than half of the elderly males and less than half of the elderly females live with their sponse. In addition, a slightly larger percentage of females live either alone or share a household with an other person; in many cases with a sibling or relative.

Table 1

Marital Status – Distribution of older Persons

	FRG (1979)*		USA (1974)**	
	Males %	Females %	Males %	Females %
Single	4.3	10.3	4.6	6.3
Married	79	40	79	39
Divorced	2.5	3.3	2.2	2.6
Widowed	15	46	14	52

* Statistisches Jahrbuch , 1979
** HED, USA, 1975

The majority of the elderly (60%) live in metropolitan areas, mostly in central parts of the cities. In this respect the elderly differ from the population as a whole, in which suburbanites outnumber central city residents (Carp, 1976). In addition, most older persons in the USA live in close proximity to at least one child; 8 out of 10 live within a half hour distance from a child (Shanas, 1976; Shanas & Hauser, 1974).

Education. Schooling and higher education was not emphasized in the past as it is today. Thus, noticeable differences exist between the number of years of education of the elderly today and those just joining the work force. As of 1975, in the USA 15% of the elderly were functionally illiterate, and for the remainder, a minimal education was the norm. The average urban person over 65 has had eight years of education, rural elderly have had even less (Butler, 1975).

Health. Thomae (1976) indicates that among the variables which are closely related to differences in cognitive functioning and adjustment, physical health may be the most decisive one. Fluctuations in one's health affect an individual's performance of basic personal tasks, of daily living, and of expected social roles. Health is a key personal resource for any individual, especially the elderly. Lasagna (1969) pointed out that regardless of the reason(s), the older the biological organism, the greater its risk of disease, impairment, and death. This is not to say that chronological age alone is responsible for this. Chronological age, however, is associated with morbidity as indicated by an age-related incidence and prevalence of disease and disability. The problems most frequently observed among the elderly tend to be chronic, often degenerative, rather

than acute. In addition, these states are frequently multiple, including physical, psychological and social components (Shanas & Maddox, 1976, pp. 593-594).

Health is a complex issue influenced by many variables, both extrinsic and intrinsic ones. And, as a coin, should be defined and appraised from two sides in terms of the presence or absence of disease (medical model), and in terms of how well the older person is functioning (The World Health Organization (WHO), 1974).

The National Center for Health Statistics (NCHS, 1965, 1971, 1973) has produced a profile on physical health in the later years of life. Figures regarding the distributions of illness and disability among older persons are presented. Data reported here are referenced from the works of Butler (1975); Institute of Medicine (IOM), (1978), and Shanas & Maddox (1976). Shanas & Maddox note that even though the profile of physical health of older persons in the USA may differ in detail from the profile of similar persons in other industrial societies, the profile will probably be generally applicable to such societies (Shanas & Maddox, 1976, p. 601). Major findings are summarized as follows:

1. Chronic diseases are the hallmark of old age; some 80% of the elderly population living outside institutions have at least one chronic disease. About 50% of them report some limitation of normal activity related to chronic health conditions.

2. Poor vision increases with age. Less than eight percent of the elderly aged 65-79 have good vision (20/20+) and the proportion of moderate to severe visual defects is considerably higher among the elderly.

3. Hearing impairments also increase with age; one third of the aged 65-74 have significant hearing loss in the frequencies essential in the range associated with normal speech.

4. Dental problems are associated with advancing age: 50% of the 65 and older have no natural teeth and over 80% have diseases of the tissues supporting or surrounding remaining teeth.

5. Major causes of death in late life are diseases of the heart (cardiovascular disease), malignant neoplasms (cancer) and cerebrovascular disease (mainly stroke). At least 40% of all individuals over the age of 65 years will die of cardiac disease and 15% of cerebrovascular disease.

6. Degenerative joint disease (arthritis) develops with advancing age. The symptoms vary from simple stiffness to pain in the use of the joints to increasing loss of mobility. Likewise diabetes mellitus has become increasingly common in older people: 15% of those over 65 and 25% of those over 85 have this disease.

7. Acute episodes of illness such as respiratory disease may occur annually and restrict one's activity. Acute illness is more common among young adults.

8. Restricted-activity days and bed-disability increase with age. They are slightly higher for women and highest among those with lowest socioeconomic position. These comparisons were made between age groups 45-64 years and 65 years and over. Individuals who continued to work after 65, however, could not be differentiated from the 45-64 age group for these factors.

9. Rates of institutionalization of older persons as in older industrialized societies remain under 5%.

10. Regarding self-reports of health status, the majority of old people report themselves to be in good (40%) or excellent (29%) health, with only 9% reporting poor health.

In closing, one cannot stress enough the importance of health to the aging individual. Aging appears to be associated with an increase in chronic illness, which in turn limits physical and mental abilities. However, it should not be overlooked that what appears to be the same degree of impairment among the elderly does not necessarily result in the same degree of disability.

Biologic Aspects of Aging

Cowdry, nearly four decades ago, addressing the science of aging, stated that "Since almost all living organisms pass through a sequence of changes, characterized by growth, development, maturation, and finally senescence, aging presents a broad biological problem" (Cowdry, 1942, p. XV). Today, this biologic view is still expressed, i.e., all living organisms undergo senescence, and this appears to be the final phase of a genetic program that directs embryogenesis, postnatal development, puberty, and adulthood (Institute of Medicine (IOM) Aging and Medical Education, 1978, p.1). From birth to maturity (20-30 years) biologic changes are incremental, whereas from maturity onward, the totality shifts and becomes decremental. Literature addressing these issues as summarized by the Department of Health, Education and Welfare (HED) Working with Older People, (1978), indicates "that aging is a process or set of processes inherent in the organism and probably independent of, although influenced by, the environment. A major problem is to identify the changes due to age alone and to distinguish them from specific processes of disease or injury" (HED, 1978, p. 41).

A similar concept advanced by Strehler (1962, 1964) was that the biologic aging process has four characteristics: aging is universal, progressive, decremental, and intrin-

sic. Regarding the last descriptor, it is still not clear whether the aging processes seen, e.g., in cells, are intrinsic to the cells themselves or are the effects of a decline of the entire body to function cooperatively. Research supports both views.

The following section addresses age-associated changes and decline in bodily systems and functions. A complete presentation of the research findings that constitute the body of knowledge on the biology of aging is beyond the scope of this report; rather, some examples of research findings which are applicable for this study are presented.

Cells are the basic units of life. The human body is made up of billions upon billions of cells. There are two basic types of cells: mitotic or proliferating (capable of multipying or dividing throughout the life span) and postmitotic or nonproliferating (incapable of division) (Hayflick, 1977; HED, Cells and Aging, 1979); i.e., the latter class is not replaced when lost. Research indicates there is a gradual loss of cells as the individual ages, and there are age-related changes such as cells losing their capacity of proliferating (increasing in number), becoming larger, and the structural pattern of the tissue make-up becoming increasingly irregular. In addition, the number of cells in the body may decrease by 30% between youth and old age (over 75) (HED, 1978, 1979).

Regarding the extracellular matrix, (e.g., collagen and elastin components), a fairly uniform series of age-related changes are found in the matrices of connective tissue outside the cell. What happens is that the connective tissue, made up of collagen fiber, gets tougher and the collagen gets denser, leading to such changes as

inefficient cardic contraction and less distensible blood vessels. The elastin becomes fragmented and calcified with age, also reducing tissue elasticity Balazs, 1977).

Skeletal muscle, like cardiac muscle, is a postmitotic tissue. It is rich in collagen and with age becomes less elastic. With increasing age this progresses to muscular atrophy, slowness, and decrease in efficiency of motor function. It is difficult, though, to differentiate alterations in muscle function caused by factors intrinsic to muscle from those that have a neurologic basis, e.g., Parkinson's disease, or are due to lack of conditioning (Gutman, 1977).

The heart muscle, a postmitotic one, is believed to enlarge as a result of age itself, and may represent an attempt of the organ to compensate for the loss of heart-muscle cells. In human beings, the left ventricular wall of the heart may be 25% thicker at age 80 than at age 30. Among other changes in the heart structure, the valves become thicker and stiffer with age. The normal electrocardiogram shows little change with age. The heart's ability to move blood (cardiac output) drops with age, but to an extent this is considered normal.

The arteries become less flexible with age and have half the stretch of young ones, which tends to make the heart work harder. With increasing vascular rigidity it is not surprising that blood pressure increases with age, both the systolic and diastolic components.

The immune system, as the primary defense mechanism of the body, is essential for the preservation of life. However, with the passage of time, alterations trans-

pire within the immune system. There is a decline in the protective mechanism, impaired surveillance, and a distortion in its functions. These age-related immune dysfunctions can lead to increased susceptibility to infections and shorter life expectancy. It appears that the protective mechanisms of the immune system reach a peak during adolescence and then decline in conjuntion with the involution of the thymus (Buckley, 1973; Makinodan, 1977).

Visual acuity decreases with age; man sees more poorly as age increases. The degenerative and functional changes in vision are due to cumulative damage to the transparent portions of the ocular system, loss in the extent of the visual fields, decrease in the speed of adaptation to darkness, elevation in the threshold of light perception, and a greater proportion loss of visual acuity in dim illumination. In addition, there is a decrease in pupil size, and the pupil responds less quickly to changes in light intensity (Fozard et al., 1977; Ordy & Brizzee, 1979).

Auditory decline with age is well established (Ordy, Brizzee, Beavers, & Medart, 1979). The most common source of auditory deficiency is probably presbycusis. Presbycusis is "characterized by a progressive bilateral loss of hearing for tones of high frequency due to degenerative physiological changes in the auditory system as a function of age" (Corso, 1977, p. 535). Most individuals over 60 lose their serviceable hearing for frequencies above 4,000 cycles. Also, the ability to identify words, e.g., word discrimination is affected more. With age, clinical manifestations of deterioration are also increasingly evident in the human vocal system, and these tend to disrupt the communication sys-

tem Corso (1977) and Ordy et al. (1979) suggest these deficiencies restrict the degree and scope of the elderly's social interactions.

External signs of aging, i.e., face, figure, skin and hair show the most characteristic manifestations of aging, especially wrinkling and sagging of the skin and greying of the hair.

The complexity of structure and function of the nervous system make it extremely difficult to develop a comprehensive view of the aging process in the nervous system. Like the other postmitotic organ systems of the body, the nervous system undergoes a number of different kinds of postmaturational and degenerative changes with advancing years (Strehler, 1976). Age-dependent anatomic changes (summarized by Strehler, 1976; Terry, 1978) include a decrease in the number of cells and nerve fibers in certain portions of the brain and a gradual decrease in brain weight, which may amount to as much as 10% (between 20 and 90 years of age). Studies have shown a loss of neurons varying from 20 to 50% in areas of the cerebral cortex taken from aged patients who died without a history of relevant neurologic disease. Changes in cerebral blood flow have also been observed during aging (Obrist, 1965).

In summary, it appears that the biology of aging is characterized by time-dependent alterations in the ability of an organism to adapt to environmental change. It is believed to be an integral part of the cycle of growth and development (IOM, 1978). This view was also expressed nearly two decades earlier by Handler: "Aging is the deterioration of a mature organism resulting from time-dependent, essentially irreversible changes intrin-

sic to all members of a species, such that, with the passage of time, they become unable to cope with the stresses of the environment, thereby increasing the probability of death" (Handler, 1960, p. 200).

Psychologic Aspects of Aging

Psychologic age refers to the individual's capacity for adaptive behavior to the demands of the environment and is influenced by the state of key organ systems like the brain and the cardiovascular system (Birren & Renner, 1977). It is also influenced by cognitive functions and personality dimensions. Psychologic aging across the life cycle in contrast with biologic aging suggests that one of the important features of this process is the increase in interindividual differences/variability with time and age (Baltes, 1973; Palmore, 1974; Rudinger, 1976; Thomae, 1976). Such findings have advanced the science of gerontology, shed more light on the meaning of psychologic aging, and stressed the importance of examining both intra- and interindividual differences. Instead of viewing psychologic aging as standardized across the life span, it is seen that a lifetime of experiences increases individual differences, and as Baltes states results in "progressively less age-related homogeneity" (Baltes & Willis, 1977, p. 136).

The present section focuses on psychologic aspects of aging and identifies and distinguishes among those features that represent "normal" aging. As with the preceding section, a comprehensive presentation of the research findings that form this body of knowledge is beyond the scope of this report. Rather, the review spotlights current findings in the area of cognitive functions such as intelligence, learning, memory, speed of response and personality.

Intelligence and its relation with psychologic aging is well documented and reviewed (e.g., Baltes & Labouvie, 1973; Baltes & Schaie, 1974; Birren et al., 1963; Botwinick, 1967, 1977; Eisdorfer, 1973; Eisdorfer & Wilkie, 1973; Horn, 1970, 1975; Horn & Catell, 1966, 1967; Horn & Donaldson, 1976; Jarvik, Eisdorfer & Blum, 1973; Lehr, 1972; Rudinger, 1976; Schaie & Strother, 1968; Thompson, 1973). Common to all of them is the view that intelligence can be divided into "fluid" and "crystallized" intelligence (Catell, 1963; Horn, 1970; Horn & Catell, 1966, 1967). Fluid intelligence matches the growth and decline of biological processes - steady decline from early adulthood onward - whereas crystallized intelligence, which is dependent upon learning and acculturation, is assumed to show an increase through adulthood and only a slight decline in old age (Horn, 1970).

Results from cross-sectional studies have tended to show a decrement with a greater decline recorded on performance subtests than on verbal subtests. Differences, though, are reported on intellectual abilities from a longitudinal perspective (Baltes & Schaie, 1976; Horn & Donaldson, 1976; Schaie, 1968, 1977; Schaie & Labouvie-Vief, 1974; Schaie & Strother, 1968). Jarvik et al. (1973) summarize the findings in longitudinal studies regarding intellectual functioning in the later years of life and suggest there is a stability of verbal scores and a progressive decline in performance on speeded tasks regarding intellectual functioning in the later years of life. This summary is also applicable for changes in cognitive functioning in the Bonn Longitudinal Study (Rudinger, 1976) and the Duke Longitudinal Study (Palmore, 1974). Savage et al. (1973), however, indicate somewhat the reverse. They reported a significant general trend towards decreasing levels of verbal

intelligence and increasing levels of performance intelligence, a span of seven years involving the 56 survivors. They postulate an explanation of these findings in terms of a "survival sample" concept, i.e., continued survival is associated with the ability to handle new verbal and performance material. Botwinick (1977) concludes that both approaches, i.e., cross-sectional and longitudinal, provide similar interpretations; differences are quantitative, not qualitative. In addition, differences in patterns of response among the elderly may in large measures be influenced by other factors, such as sampling bias, selective drop, suitability of tests, sociological variables, health, sex, educational level, socio-economic status (Botwinick, 1977; Eisdorfer, 1973; Rudinger, 1976).

Learning refers to "the acquisition of information or skills measured by an improvement in some overt response (Botwinick, 1967, p. 48). Needless to say, many factors affect learning performance; e.g., motivation (Smith, 1970); task relevancy (Botwinick, 1973); anxiety-arousal (Eisdorfer, 1967, 1968; Eisdorfer, Nowlin, Wilkie, 1970); speed-paced/self-paced (Arenberg, 1965; Botwinick, 1973; Canestrari, 1963; Eisdorfer, Axelrod, Wilkie, 1963; see also review by Arenberg, 1973; Arenberg & Robertson-Tchabo, 1977); cautiousness (Botwinick, 1973); fatigue (Furry & Baltes, 1973); and finally transfer & interference (Arenberg & Roberston-Tchabo, 1977). It is difficult to separate these components of performance from learning and to estimate the variance created by them.

Results of the Baltimore Longitudinal Study (Arenberg, 1967) indicate a deficit in verbal learning as measured by pair-associated and serial performance in the later years of life (over 70 years of age). Results of cross-sectional studies demonstrate that an improvement in the elderly is found in learning tasks when they are given

increased time between presentation of items or are permitted self-pacing (Arenberg, 1965; Canestrari, 1963; Eisdorfer et al., 1963). Arenberg & Robertson-Tchabo (1977) state that these age-related performance findings indicate the elderly need additional time to search for, recover, and produce a stored response, a retrieval rather than a storage difficulty. Additional investigations by Eisdorfer (1967, 1968) suggest that overarousal (response inhibition) may be the crucial variable in the apparent learning difficulty of older persons. Apparently, response inhibition and poor performance among the aged are associated with heightened and persistent autonomic nervous system arousal, as measured by plasma free fatty acids; therefore, older subjects experience greater autonomic stress in the learning situation and take longer to recover (Eisdorfer et al., 1963; Troyer et al., 1966, 1967). Savage et al., (1973) assessed both verbal and perceptual-motor learning ability over a period of 18 months in 56 survivors of the seven year longitudinal study. They reported no change in the level of verbal and perceptual-motor learning in this time span. They concluded that the "maintenance of a reasonable level of the ability to cope with new verbal and performance material is associated with continued survival" (Savage et al., 1973, p. 113). They also indicated that successful performance on the perceptual-motor test is not affected by the level of intelligence or advanced chronological age.

In summary, there appear to be consistent age-related learning deficiencies on verbal tasks which may be partially due to difficulties in retrieving stored information. It is, however, important to emphasis that these learning deficiencies may reflect memory impairment in terms of recall and recognition. Thus deficiencies are found because the material was never "learned" in the

first place. Because of the scarcity of data on perceptual-motor learning ability, no conclusions are drawn. The status of this research area is best expressed by Arenberg & Robertson-Tchabo (1977, p. 425): "Currently, no formal systematic or elaborated theory has been proposed to account for age-related differences in learning probably because model or theory building is premature in relation to the empirical base of knowledge".

Memory function and its relation to aging have been well reviewed (Arenberg, 1973; Botwinick, 1973; Botwinick and Storandt, 1974; Craik, 1971, 1977; Murdock, 1974) and, of course, the respective literature is voluminous. Aspects investigated dealt fundamentally with age differences in short-term and long-term memory, i.e., based upon the two-storage model: primary and secondary memory (Atkinson & Shiffrin, 1968; Waugh & Norman, 1965). Seldom, though, have age-related changes in memory functions been subject to longitudinal investigations; thus, the majority of findings cited are based on cross-sectional research.

Craik (1974, p. 399) contends, based upon his review, that age differences in primary memory are minimal, given that items are fully perceived and that no reorganization is needed. However, if the task exceeds the boundaries of primary memory, differences occur, and these are suggestive of acquisition or retrieval difficulties in secondary memory. In addition, tasks involving divided attention or the manipulation or reorganization of stored material are done less well by older subjects. Craik elaborates further on secondary memory and reports age decrements in free recall due to retrieval difficulties from storage; but this is not the case in recognition (e.g., Schonfield & Robertson, 1966). Evi-

dence is also provided that age deficits in secondary memory stem from less effective acquisition processes. Bischoff (1976) strongly suggests, though, that almost all cross-sectional short-term memory research shows a decrease with age, more so with recall. As is often the case, reviews of psychological literature do not always complement one another. Nevertheless, there is a need for future research in the area of memory and its changes throughout the life cycle.

Speed of response generally becomes slower with increasing age. Birren strongly proposes that "with advancing age individuals on an average show a tendency to a slowness in response which reflects a basic change in the speed with which the central nervous system (CNS) processes information" (Birren, 1974, p. 808). The process, Birren contends, should be the independent variable when studying aging; and from this base other kinds of age-related changes in behavior can be interpreted and analyzed. Aging in the CNS is manifested by the behavior it mediated, e.g., perceptual and memory processes become less effective (Birren, 1966, 1974). Among the most common methods used to assess speed of response are various types of reaction tests.

Research employing these psychometric tools demonstrate the age-related RT decrements (Birren, 1965, 1974; Botwinick, 1973; Fozard & Thomas, 1975; Welford, 1977), and the majority of evidence points to the central nervous system as the antecedent of this slowing. Additional explanations stress the role of central processing and decision-making functions. Other factors contributing to increased RT are the subjects' monitoring, set expectations, cautiousness, physical exercise, and motivation (Botwinick, 1973; Welford, 1977). Additional cautions when interpreting RT findings are that individual dif-

ferences in RT within an age group are usually larger than the differences between age groups, and most studies of RT are cross-sectional (Fozard & Thomas, 1975). In closing, Mathey (1976) indicates that the RT information supplies information regarding other variables which are essentially not confined to the CNS, such as general flexibility and general physical health, and suggests that simple reaction time measurements are an important index of functional age - an individual's level of capacities relative to others of his/her age for functioning in a given society (Birren & Renner, 1977).

Personality has been defined as a complex, interactive set of psychologic and behavioral characteristics within the human organism influenced from within (biologic processes) and from the outside (socio-cultural experiences). Issues addressed in this field focus on the continuities and discontinuites of personality into adulthood and late life (Baltes & Schaie, 1973; Chown, 1968; Havighurst, 1973; Neugarten, 1964, 1968, 1973, 1977). The majority of the literature supports the notion that there is more continuity in an individual's personality: "persons age in ways that are consistent with their earlier life histories" (Neugarten, 1972, p. 12). That is to say, earlier personality structures, coping and adaptive styles along with expectations of life are predictors of future personality styles (Neugarten, 1972).

Studies of age-related change in personality have usually been evaluated in cross-sectional studies with the focus being on single traits or dimensions of personality. Neugarten (1977) concludes that findings are inconsistent except for the trait introversion - "The findings add up to the generalization that introversion increases with age in the second half of life" (Neu-

garten, 1977, p. 636). Summarizing longitudinal and follow-up studies, she reports: "Their major contribution has been in demonstrating individual differences: that persons maintain their recognizability and that, in this sense, there is continuity of personality over time" (Neugarten, 1977, p. 641). Such findings, notably these individual differences in patterns of aging, are clearly evidenced in the Bonn Longitudinal Study (Thomae, 1976).

In closing, attention is again drawn to Neugarten and associates. She indicates there are consistent age-related changes in the area of self-perception and one's internal thinking. "Preoccupation with the inner life (self) became greater; emotional cathexes towards persons and objects in the inner world seemed to decrease, the readiness to attribute activity and affect to persons in the environment was reduced; there was a movement away from outer-world to inner-world orientation. This change was described as "increased interiority" (Neugarten, 1973, p. 320).

Other personality-related variables are the ways in which individuals adjust and adapt to advancing age and their satisfaction with these changes. The Kansas City study of adult life identified four personality types in adjustment:

1) Integrated - high life satisfaction regardless of the extent of their role activity.

2) Armored or defendant - high life satisfaction when their activity level was medium or high.

3) Passive-dependant - medium on life satisfaction regardless of degree of activity

4) Unintegrated - medium or low in life satisfaction, whether active or disengaged (Neugarten, 1968).

Life satisfaction is a nebulous feeling and for the aged perhaps more retrospective than prospective. Responses are presumably based upon an inventory of one's biological, psychological and sociological state of being (Bischoff, 1976). Individuals reporting to be more satisfied tend to be healthier, more socially active, and to have more income and education (summarized by Palmore & Luikart, 1972). In the Duke Longitudinal Study (Palmore, 1974) self-rated health followed by organizational activity and internal control orientation were the strongest variables related to life satisfaction.

Social Aspects of Aging

Social age refers to the roles and social habits of an individual with respect to other members of a society, i.e.,does a person behave younger or older than one would expect from his or her chronological age (Birren & Renner, 1977). In addition, the social study of aging addresses issues such as social and cultural as distinct from the biological meaning of age and the bases of social integration and adaption in the later years of life (Maddox & Wiley, 1976). Findings from this type of research stress the importance of not overlooking the central role of culture and society in determining indidual and group variations in the aging process. Also this discipline investigates the effects that attitudes, myths and stereotypes have on the elderly. Bennett & Eckman (1973) imply that attitudes towards aging may be critical for adjustment and that some may contribute to observed maladaptive behavior among the aged. Butler (1975) indicates the stereotyping and myths surrounding old age can be explained in part by lack of knowledge

and by insufficient contact with a wide variety of older people. However, there is another factor - "a deep and profound prejudice against the elderly", labelled "ageism" by Butler - the process of systematic stereotyping of and discriminating against people because they are old (Butler, 1969).

As with the two previous sections, the scope of the review is somewhat governed by the allocation of space. The review will concentrate, therefore, on the following parameters: the social role activities of the elderly, leisure behavior, and ecological factors.

Social roles. Concern regarding a general isolation of the aged has stimulated a considerable amount of research on social role activities of the elderly (Olbrich & Lehr, 1976). These authors reported that "interest in relationships between social role activities and aging was strongly aroused by the publication of Cumming & Henry's disengagement theory" (Olbrich & Lehr, 1976, p. 113). The publication of this theory has created and will continue to create controversy in social gerontology and generate research notably in the area of disengagement versus activity.

Essentially, the disengagement theory hypothesizes (1) a mutual withdrawal of the self from others in any given social system; (2) this process is biologically and psychologically intrinsic and inevitable; (3) the disengagement process is not only correlated with successful aging but also usually necessary for aging (Cumming & Henry, 1961). Bischof (1976) summarizes disengagement to mean (1) withdrawal of intense emotional attachments to people and objects; (2) a lessened desire for approval

and increased freedom of choice, and (3) a greater tendency to select activities that will give more immediate gratification. Additional variations of this theory are outlined by Olbrich & Lehr (1976). In contrast, activity theory holds that (1) the majority of normal aging persons maintain level amounts of activity and engagements, (2) the amount of engagement or disengagement is influenced more by past life-styles and by socioeconomic forces than by any intrinsic and inevitable process, and (3) maintaining or developing substantial levels of physical, mental and social activity is usually necessary for successful aging (Havighurst, 1964, 1973; Maddox, 1964; Palmore, 1968).

Numerous variables intervene when determining whether or not disengagement is a satisfactory process in later life, e.g., type of personality, physical and mental health, past activity level and roles, and present number of friends (Botwinick, 1973; Neugarten, 1973; Havinghurst, 1973). Palmore & Maddox concluded that "continued engagement appears to be typical of the majority of normal aging persons; disengagement is not inevitable, rather the amount of activity is strongly related to past life-styles and to external factors, and - most important from a practical standpoint - maintaining activity is usually associated with more successful aging and life satisfaction" (Palmore & Maddox, 1977, p. 50).

Olbrich & Lehr (1976) also present data regarding these processes. They investigated longitudinally the development of older people's social role behavior. In brief summary, a considerable stability in intrafamilial social interaction was noticed, as was a "more dynamic change in roles rather peripheral to the psychological

self." Changes in social role behavior in terms of activity and satisfaction are described as forms of adapting to and coping with developmental tasks. Also "there is a great amount of interindividual variance in social role behavior." In closing, they state, "Predominant in our sample is a form of adaptation characterized by congruence between changes in role activities and satisfaction with them." Regarding such processes, we think that these changes described by Cumming and Henry's (1961) disengagement theory play a minor role in the development of older people's social role behavior" (Olbrich & Lehr, 1976, p. 125).

Leisure. Another important social aspect of aging implicit in the disengagement versus activity issue is that of leisure behavior of the elderly. Leisure, as conceptualized from the action theory perspective (Parsons, 1951a, 1951b, 1955 - referenced in Gordon & Gaitz, 1976) is "discretionary personal activity in which expressive meanings have primacy over instrumental themes, in the sense that grafitication of present needs, wants, desires, or objectives is given precedence over practical preparation for later gratification" (Gaitz & Gordon, 1972, p. 38 ff). Examples of personal expressivity are relaxation, diversion, self-development, creativity, and sensual transcendence (Gordon & Gaitz, 1976, p. 314). Activities such as these are important influences on adjustment to retirement and/or coming to terms with the children's departure from home (Schmitz-Scherzer, 1976).

A pioneer in the field of social gerontology and leisure has been Havighurst (1957, 1961; Havighurst & DeVries, 1969). An important point concluded by him was that even

though the content of leisure activity was closely related to sex and social class, the significance of the activity to the individual was most closely related to personality factors.

Schmitz-Scherzer (1976) analyzed the longitudinal change in leisure behavior of the elderly (Bonn Longitudinal Study on Aging) with particular emphasis directed to the question of constancy and variability in leisure behavior. An overview of the longitudinal findings suggests (1) constancy predominated - more than 50% of the activites had neither group-specific nor intraindividual changes; (2) certain changes refer to different intraindividual patterns of change in the sex groups; (3) ANOVA indicates increase in reading newspapers, watching TV, and gardening, whereas being visited and entertained decrease.

The Houston Study of Leisure across the Life Span (Gordon & Gaitz, 1976, p. 325-334) evaluated the effects of age and life-stage on leisure choices and satisfactions. This cross-sectional study included 1441 persons and was stratified according to sex, ethnicity, occupational level, and five age groups. In brief, their findings were: "the older the respondent, the lower the level of general leisure activity, the narrower its breadth, the less intense the forms, and the less likely a person to engage in the forms of leisure activity that can be characterized as highly active, external to the home, and physically demanding. Other leisure activities, the moderate intensity and home-centered forms of sociability and media-based symbolic interaction, continued into the oldest age group, and there was no evidence that individuals "disengage" from immediate relatives and friends" (Gordon & Gaitz, 1976, p. 333-334).

Ecological factors. Studies have shown that environment factors play an important role in enhancing or impeding the ability of the elderly to function within the community (Carp, 1976; Eisdorfer, Lindheim, Byerts et al., 1976; Lawton, 1977; Lehr, 1973; Lehr & Olbrich, 1976). These factors include proximity to family and friends, availability of services, proximity to commercial and recreational activities, accessibility and usability of transportation, and fear for physical safety (Carp, 1966; Eisdorfer et al., 1976; Havighurst, 1969; Lehr, 1973). Preferences of the elderly regarding, e.g., living in age-segregated and retirement communities in comparison with age-integrated and communities with different age groups reveal no homogeneous pattern (Carp, 1976).

Lehr and Olbrich (1976) reported on the ecological correlates of adjustment to aging (Bonn Longitudinal Study of Aging). Ecological variables were categorized according to physical environment, social environment, personal life space, and cognitive representation of his or her environment, and were correlated with personality dimensions. Relations existing among ecological variables and personality dimensions were as follows: (1) physical environment - older people living in central parts of cities are more ready to become involved, and are more positive; (2) social environment - people living together tend to be more active and indicate more security; (3) personal life space - more money and access to telephone and daily news relate to higher values in personality dimensions; (4) cognitive representation - less stress, more active, positive, secure but less ready to become involved. Satisfaction with present life situation is positively correlated among older people who live in the center of the city, in smaller towns, without a garden, in larger apartments, or live with others.

A summary of the preceding sections on "normal" aging indicates the following: the proportion of the elderly is increasing. Females represent the larger majority of the elderly and, on the average, outlive males. Thus, the likelihood of widowhood is greater for women. The majority of elderly men and women live in metropolitan areas, either with their spouse or alone.

Health is a key personal resource for any individual, especially for the elderly. Advancing chronological age is associated with morbidity as indicated by an age-related incidence and prevalence of disease and disability. Chronic diseases are more often found among the elderly, and these states are frequently multiple. However, it should not be overlooked that what appears to be the same degree of impairment among the elderly does not necessarily result in the same degree of disability.

Biologic aspects of aging indicate a sequence of events across the lifespan: the individual grows and develops, these processes peak at maturity plateaus, and then a gradual decline in functional capacity of most or all bodily organ systems occurs.

Psychologic aspects of aging imply that a single avenue which is characteristic of the life cycle does not exist. Rather, the cumulative experiences of a lifetime result in wide variations in the aging process.

Social aspects of aging echo this latter theme and also stress the importance of viewing the aging process in light of the interaction between the individual and society.

Institutionalization

Institutionalization represents a major change in a person's pattern of living and is not at all common among the elderly in the United States or in European countries. About 5% of the elderly Americans (Office of the Nursing Home Affairs, 1975; Siegel, 1976) and 4% of the elderly Germans (Dittrich, 1972) live in institutions. In general usage, these settings are defined as residential facilities providing numerous central services that meet particular needs of the client because of chronic physical and/or chronic mental disabilities. Such settings imply permanent or indefinite residence and involve a radical departure from a community living pattern (Cohen, 1974; Lieberman, 1969).

Traditional views concerning the effects of institutionalization imply that the institutions have deleterious effects on the psychological well-being and physical survival of the residents and that the residents differ markedly from community residents, i.e., they are disoriented and disorganized, withdrawn and apathetic, depressed and hopeless. Townsend (1962, pp. 328-329) succintly summarizes this view:

> In the institution, people live communally with a minimum of privacy and yet their relationships with each other are slender. Many subsist in a kind of defensive shell of isolation. Their mobility is restricted, and they have little access to a general society. The social experiences are limited, and the staff lead a rather separate existence from them. They are subtly oriented toward a system in which they submit to orderly routine, noncreative occupation, and cannot exercise as much self-determination. They are deprived of intimate family relationships and can rarely find substitutes which seem to be more than a pale imitation

> of those enjoyed by most people in a general community. The result for the individual seems fairly often to be a gradual process of depersonalization. He has too little opportunity to develop the talents he possesses and they atrophy through disuse. He may become resigned and depressed and may display no interest in the future or in things not immediately personal. He sometimes becomes apathetic, talks little, and lacks initiative. His personal habits and toilet may deteriorate. Occasionally he seems to withdraw into a private world of fantasy. In some of the smaller and more humanely administered institutions, these various characteristics seem to be less frequently found, but they are still present.

Lieberman (1969) in an excellent review on the effects of institutionalization states that this opinion is supported by many cross-sectional studies. They suggest that residents share the following characteristics: poor adjustment, depression and unhappiness, intellectual ineffectiveness but not necessarily incompetence, negative self-image, low range of interests and activities, and they are withdrawn and unresponsive in relationship with others. In addition, there is a higher mortality rate. Lieberman (1969) and Tobin & Lieberman (1976) caution, however, that it may be unwise to conclude that such differences between instututional and community residents are the sole result of institutionalization, per se; rather, numerous other factors and variables may be operant in the process of becoming institutionalized. Explanations cited are: selection biases or processes, preadmission effects (waiting-list), institutional environment and research design.

Selection biases proposes that a particular type of older person seeks institutional care - one who is either characterized by the typical institutional portrait prior to entering the institution, or one who has features that sensitize him or her to respond negatively to living in institutions (Tobin & Lieberman, 1976). In addition, the typical pathological psychological characteristics attributed to institutionalization may be the result of the elderly person's poor physical health status (Birren, 1959; Coe, 1965; Lehr, 1968; Schmelzer & TeBert, 1969), e.g., cardiac disease may be the concealed source of prominent aberration in cognitive functioning in the older person (Nowlin, 1973), not the institution. Other factors contributing to differences between these two samples are lack of social familial support, family status, lack of financial resources (Dunlop, 1976; Townsend, 1965; Webb, 1959) and personality (Goldfarb, 1969). Additional relevant work in this area has recently been published by Vicente, Wiley & Carrington (1979). They examined the factors associated with the risk of institutionalization before death. They reported, based on multivariate analyses, that being unmarried, old, living alone, poor, and having chronic conditions and physical disabilities are associated with risks of entry into a nursing home. Of all these factors, age was the best predictor of institutionalization. Interesting also was the fact that medical needs may not be the sole or even the major determinant of entry into nursing homes (Vincente et al., 1979, p. 367).

Thus, it appears evident that institutions meet the needs of the frail and sick, those who lack family and economic support, and those individuals, prior to entering, who share some characteristics of the population they are soon to join. In summary, behavior that is attrib-

uted to institutional living may be inherent to the types of individuals who seek institutional care.

Preadmission effects suggests that the factors that cause noxious effects are set into motion by the process of becoming institutionalized, i.e., during the period prior to actually entering the institution. Such effects are attributed to "the loss of meaning of separation imparted to the process and to the experience of being abandoned" (Tobin & Lieberman, 1976, p. 218). In addition, during the waiting period individuals may spend more time evaluating the pending move and the possible consequences such as (a) leaving the family environment for a foreign one that may be their last home; (b) the greater distance between them and their family and friends; (c) changes in their leisure and social activities; (d) a deterioration in the quality of their living conditions and a decrease in their independence and privacy. Such thought processes may have adverse effects on the psychological well-being of the elderly (Kasl, 1972) and may surface prior to or immediately after entering the institution.

Institutional environment is radically different from living in the community with one's family or alone. No matter what the environment is like or how loving and caring the staff is, this new type of life style is usually completely foreign to the resident's previous way of existence, and in turn, may induce harmful effects. Goffman (1961) in his characterization of the "total institution" argues that these settings dehumanize their residents. A basic characterictic of total institutions is the breakdown in the barrier between sleep, play and work, so that all three of these activities of everyday life take place in the same setting with the same people.

In such an environment, residents are completely controlled, stripped of their individuality and decision-making processes. Goffman considers homes for the aged as "total institutions".

Additional characteristics of institutional milieus have been described by Bennett (1963), Bennett & Nahemow (1965), Kleemeier (1959) and Townsend (1962). Common to all were (a) congregate residual living; (b) segregation from the outside society; (c) activities oriented to the institution; (d) a relatively restrictive environment; and (e) a virtually decision-free environment. Anthes (1975) analyzed the organizational structure of 526 homes for the aged in the FRG. Based on Goffman's concept of the total institution, he reported that most homes have a hierachial organization, and the management possesses an almost unassailable position of power. He summarized by stating that house rules bind the residents to institutional norms, deprive them of personal autonomy and the power to plan their days, and control their relations with the external world. In additon, the structure of many homes for the aged in the FRG is established in a manner indicative of being the resident's last home (Lehr, 1970) and not as a rehabilitation center.

These dimensions of institutional settings, coupled with the fact that residents are in daily contact with other individuals who are frail, sick, alone, in need of care, close to death and possessing a limited and controllable future, have a detrimental effect on a person's physical and psychological well-being.

Therefore, it appears essential to view the effects of institutionalization as a process beginning when first thoughts are entertained that the solution for the elderly person may be institutional care. Events leading up to this decision, as well as the changes that may occur once the decision has been made, can cause negative effects on the future resident. These stages, coupled with the elderly person's immediate reaction once he or she has entered the institution may, in part, be responsible for the typical portrait which is usually attributed to actually living in an institutional environment.

Research design. The majority of studies used cross-sectional approaches and compared the institutionalized sample with community residents. In the majority of the cases findings were attributed to the effects of institutionalization without controlling for variances created by other factors, e.g., selection biases, preadmission effects, and length of hospitalization. Results of longitudinal studies (as well as cross-sectional ones summarized in the next section) support cross-sectional findings regarding the disparities between institutional and community residents. However, they clearly indicate that the variance is explained not only by the institutional setting, and stresses the necessity of viewing the typical institutionalized portrait as the end stage of a process. Without doing so, findings and conclusions may be misleading.

In order to justify further elaboration on research design and methodological considerations, the characteristics of the institutionalized elderly need to be highlighted. Without such information, one may be limited in their appraisal.

Characteristics of the Institutionalized Elderly

This section sketches a portrait of the institutionalized elderly based upon current English and German literature. Areas highlighted are their demographic characteristics, physical and mental status, diagnoses and length of stay.

Age. Advance age increases one's chance of entering an institution mainly because as one grows older the likelihood of chronic illness increases as does the likelihood of being alone. The average age of residents in long-term care institutions or nursing homes ranges from 77 to 81 years and in residential homes for the elderly from 70 to 75 years. In institutions and nursing homes the proportionate representation of older people is even more striking at more advanced ages, approximately 50% are in the eighth and ninth decade (Fischer, 1976; Fisseni, 1974; Gottesman & Hutchinson, 1974; Kraus, Spasoff, Beattie et al., 1976; Grieger, 1971; McDonald, 1979; Savage et al., 1973; Tobin & Lieberman, 1976).

Sex. Women represent a larger proportion of the institutionalized population. Since they have a longer life expectancy than men, they have a greater chance of being ill and alone. In the majority of studies reviewed the distribution of female residents varied from a low of 60% to a high of 75%, with the average being around 70%.

Marital status. A notably higher proportion among the institutionalized in comparison with the general population are either widowed or have never been married. Findings of different countries support this and are in congruence with one another. The proportion of widowed persons in institutions is approximately 65%, of married

persons 13%, of single persons around 17%. Sex-related differences are found: females are more likely to be widowed, whereas men are more likely to be divorced or never married (Fischer, 1976; Fisseni, 1974; Gottesman & Hutchinson, 1974; Statistisches Jahrbuch, 1979; Tobin & Lieberman, 1976; U.S. Bureau of Census, 1970).

Family support refers to the lack of social (typically familial) support. The possession of this plus financial resources may keep many elderly persons from ever entering an institution. That is to say, for the chronically ill elderly person who is either married, or has children, or other relatives, his or her chances of being institutionalized are prevented or postponed (Dunlop, 1976). A study of nursing homes in England (Townsend, 1965) reported that 60% of the residents were childless, in comparison to 24% of the general population of the elderly. Additional surveys revealed a high negative correlation between the institutionalization of the elderly individual and the existence of at least one child (Frohlich, 1971). The proximity of children or relatives also plays a role. Brockinton and Lempert (1970) found in their study of British population aged 80 and over that 82% of the aged in institutions had been unable to acquire assistance from any nearby relative because of the distance between them.

Health status (physical and mental/psychologic). Pertinent data is presented on both the physical and mental disabling conditions of institutionalized people and, on occasion, of applicants to long-term care institutions and nursing homes. The major physical health reference sources are the National Center for Health Statistics (NCHS, 1972), a national survey of 920 institutions (Grintzig, 1970), and a study of Aged Patients and Nurs-

ing Home Services (Gottesman, 1971; Gottesman, Boureston, Hutchinson & Barney, 1969; Gottesman & Boureston, 1974).

Predominant physical disorders are those of the circulatory system; the most common of these are heart disease (57% had hardening of the arteries). The second most common are disorders affecting the skeletal system, namely arthritis (51%) and physical deformity (23%). Finally, around 15% had disorders of the digestive system, like diabetes (12%). These disorders, especially disturbances of the circulatory system and of the skeletal system, are most likely to affect ambulation and self-care. Results of the national survey indicate 42% of nursing home patients using one aid for ambulation and an additional 36% needing two or more. Regarding the proportion of patients who use basic care and nursing services, 70% need four or more services, such as help with dressing and bathing (NCHS, 1972). Results from other studies (Gottesman & Boureston, 1969) report that 25% of patients are independent of basic activities, whereas 55% need some help and 20% need extensive help.

Additional information regarding diagnoses, number of conditions, and services needed, show differences between young (under 60) and old institutionalized patients. Basically, far more of the young than old are reported to have a mental condition other than senility, and far fewer have a heart condition. They also have fewer chronic conditions than the old. On average, young patients have just over one condition as compared to older patients' more than three conditions (NCHS, 1972).

Regarding mental disorders, namely confusion, one study (NCHS, 1972) reported 34% had "advanced senility", another study (Grintzig, 1970) indicated 21% were unaware of their surroundings all or most of the time, and regarding the other study, Gottesman (1971) communicates that between one fourth to one third of nursing home patients, N = 1,144, are likely to be confused most of the time. To summarize these findings, it appears common that nursing home patients have multiple disabilities.

Additional relevant information has been published by Tobin & Lieberman (1976). They contrasted a sample of long-term institutionalized patients, a waiting-list sample and a community sample. Findings indicated similarities between the institutionalized and waiting-list sample, but they were quite different from the community. Overall, the former two samples had cognitive disorganization, constriction in affective responsiveness, more emotional disturbances, and diminished self-esteem in comparison with the community sample.

Studies done by Ross & Kedward (1972) and Knaus et al. (1976) support the findings presented so far. Ross & Kedward wrote that institutional residents suffered more major physical illness, were less able to maintain functional independence, were more socially isolated, and were widowed, single or divorced (81%). Knaus et al. compared elderly applicants with a community sample and found the former group was older, less often living with a spouse, and showing much more cerebrovascular disease, incontinence, recent loss of independence in daily-living activities, dementia, loneliness, and depression. In addition, they had less involvement in social and recreational activities.

Fisseni (1975) compared samples of elderly females (N: 227) living in three types of homes. Data were obtained on the participants' satisfaction with their present living situation, interest in their social environment, and their level of activity. Significant differences were found among these variables, and in each instance the elderly females residing in apartment dwellings reported more favorable results. A comparison of the findings indicated that in these homes females were more concerned about their private life, in the old folks home the central problem was the struggle between dependency and independency, and in the nursing home the females were concerned primarily with their physical helplessness and their desire of sharing life by all means yet possible.

Schick (1978) examined the relation between socio-economic factors and psychic/social well-being of a sample of elderly persons (N: 1002) living in different institutional settings. Data were obtained on psychic and social correlates of well-being. The results of the study showed the following: There was a positive relation between residents who were involved during the pre-admission phase in terms of accepting the fact of being institutionalized and deciding on which institution to enter and the level of their psychic well-being. These findings applied to only 25% of the sample and all of them were in the higher socio-economic status. Another important aspect of well-being was the health status. Individuals who were considered healthy from both an objective and subjective perspective reported a higher level of life satisfaction. Likewise, was the well-being of residents associated with the level of their social contact and activity. Elderly persons who had regular contact and were satisfied with their interactions within the home also reported having a higher level of psychic well-being.

Lieberman, Prock & Tobin (1968) compared matched groups of community residents, waiting-list applicants and institutionalized patients. They found the latter group was significantly poorer in various cognitive, affective and social functions than community residents of similar demographic and health status. The waiting-list group was similarly impaired in relation to the community group. The other comparison between waiting-list and institutionalized patients revealed greater anxiety in the waiting-list group, but greater cognitive impairment, body preoccupation, and less emotional reactivity in the institutionalized subjects.

Klingner, Kachanoff, Dastoor et al. (1976) assessed 80 newly admitted geriatric patients by a variety of psychologic tests - Bender Gestalt Test, Wechsler Memory Scale, reaction time tests, tapping rate, and critical flicker fusion. Results were compared with three age groups of normal volunteers and two control groups of elderly patients, organic brain syndrome and schizophrenic groups. The performance of the elderly volunteer group was significantly better than the newly admitted patients on the Bender Gestalt and Memory tests. Significant differences were also obtained on the RT and tapping rate tests. Elderly volunteers responded to auditory and visual stimuli approximately 50% faster and tapped about 14% faster. The control groups of patients were very similar with the newly admitted patients.

Some investigators have examined the effects of institutionalization from a longitudinal perspective. In most cases they have compared findings obtained one month after admission with those obtained one year later. Spasoff, Kraus, Beattie et al. (1978) report the following significant findings after one year: Many of the residents made new friends; residents reported a decrease in activities within the institution; no notice-

able change in the abilities of the patients to cope with activities of daily living; significant decrease in fluid intelligence as measured by colored progressive matrices and also a decrease in satisfaction with the physical aspects of care compared with the emotional aspects.

Weinstock & Bennett (1971) assessed changes in socialization and cognitive functioning in three aged groups: Waiting-list sample, newcomers (under one year) and oldtimers (over one year). At the one year assessment, the following pertinent findings were observed: the former waiting-list group showed a gain in all WAIS measures. The newcomers had no change, whereas the oldtimers had the most precipitous general drop in WAIS measures. Socialization scores reflect increments in all three groups but considerably more for the former waiting-list sample.

One of the better controlled studies evaluating changes from the anticipatory through the adaptation phase after one year was communicated by Tobin & Liberman (1976). They report findings on the select sample of 45 of the original 85 patients recruited for the study. It should be noted that 48% either deteriorated markedly or died within one year after admission; therefore, the findings reported are applicable for the survivors. In summary, the cognitive constriction found during the anticipatory phase persisted on the same level; affective responsiveness remained the same, feelings of anxiety and depression did not increase, whereas hopelessness became more pronounced, and self-perception showed stability over time. Slight changes occurred; however, they did not lead to further deterioration. They concluded that "The status of the 'oldtimer' appears to be largely a function of his or her status <u>just</u> before admission" (Tobin & Lieberman, 1976, p. 218).

Klebar et al. (1976) conducted behavioral observations of mentally impaired aged in an institutional environment on a weekly basis for a two-year period. An eight-category taxonomy, e.g. nonsocial activities, social activities plus functioning, was used to rate the subjects' behavioral level. Generally, the average weekly performance showed linear decline over the two years. However, half the subjects remained stable. Comparisons between declining and stable subjects suggest the latter had less serious medical conditions, better comprehension of their situations, were more socially active, and manifested fewer neurotic conditions.

Survivors and nonsurvivors. Dastoor, Klingner, Müller & Kachanoff (1979) conducted a three-year follow-up evaluation on the 80 original psychogeriatric patients. This report also included a comparison of the scores obtained from the initial assessment based upon survivors and nonsurvivors. Three years after the first assessment of 80 newly admitted patients it was found that 40 subjects had died. Significant differences obtained between these two groups were on age, diagnoses and on the following psychologic variables (Wechsler Memory Scale): orientation, digit span backwards, paired associate learning, recall of Bender designs and the rate of manipulation. Results always favored the survivors, i.e., they were younger, had a diagnosis of functional and not organic impairment, and performed better on all the psychologic tests at the original assessment.

Robinson et al. (1971) reported in their two-year follow-up period that age (younger), orientation to time, place and person, four sub-tests of the WAIS (information, comprehension, arithmetic and digit span) and the ability

of physical and social self-maintenance distinguished survivors from nonsurvivors. These variables which were related to prognosis two years after admission continued to be the only significant predictors of survival throughout the next 11 years. Similarity in these predictor trends was also noted in a nonhospital community sample of subjects with the exception of the mortality rate, which was significantly higher among the hospitalized sample.

Brody, Kleban & Lawton (1972) and Brody, Kleban, Waldow & Freeman (1975) supply data regarding differences in survivors and nonsurvivors after one and four year follow-up evaluations. During the first year, nonsurvivors had greater incapacities in self-care, interpersonal responsiveness, bowel control, and psychiatric functioning. Overall, they were in greater need of care and supervision. At the four year follow-up, nonsurvivors were identified as having decreasing functional competence (self-care) and decrements in sensory-motor performance. In addition, physicians' ratings of psychiatric and self-care variables differentiated the two groups.

Length of stay. Considering the chronic nature of the patients' conditions, it should not be surprising that they remain hospitalized until their death and that within the first year there is a high mortality rate. Studies addressing the second issue have a general consensus indicating that the mortality rate within the first year ranges between 25 and 33 percent (Brody et al., 1972; Brody et al., 1975; Epstein et al., 1971; Goldfarb, 1976; Lieberman, 1961; NCHS, 1973; Sposoff et al., 1978). The median stay is approximately three years (Brody et al., 1975; Dastoor et al., 1979; Epstein et al., 1971; Goldfarb, 1976; NCHS, 1973). In general

the data suggests that the high mortality rate reflects the basic condition of the person rather than the facility (Kasl,1972).

Up to this point the report has concerned itself with a brief overview of institutionalization, the effects of it, and the characterization of its population. The results of the cross-sectional studies reviewed here indicate differences between institutionalized and community residents in terms of age, sex ratio, marital status, social familial support, physical and mental health. In general, the institutional resident is aged 75 or over, female, unmarried, lacking familial support or living alone, has poor physical and/or mental health and - as is often the case - has some combination of these characteristics. Traditionally, these disparities have been attributed to the deleterious effects of institutionalization. In other words, institutions are perceived as having a detrimental effect on the physical and psychological well-being of the patients.

Results of longitudinal studies support the premise that institutional and community residents differ. However, they also provide strong evidence that this contrast is not solely due to institutionalization, per se. Rather, these variances are explained by a combination of factors: selection biases and processes, preadmission effects, and institutional life. The typical gray portrait of the institutionalized person is the cumulative result of a process, one which begins when family members notice deteriorative changes in the elderly family member and/or the family support system is no longer operative and ends approximately one year after the individual has lived in an institution. At this point the resident has either adapted to the new surroundings and survived or has deteriorated and more than likely died.

Characteristic of these studies were the variables assessed. Attention was focused on describing the sample demographically and evaluating their physical health status, major psychologic dimensions and social functions. Lacking, however, is empirical data illuminating the relationship between institutionalization and processes mediated by the CNS, such as speed of response and processing information. The CNS is essential to the organization of behavior and to the regulation of vital vegetative functions; therefore it is one of the key organ systems for the study of the phenomenon of aging (Birrer & Renner, 1977). Strehler (1976, p. 2) writes that "the CNS is one of the ideal tools for the study of the phenomenon of aging; as a largely postmitotic tissue, subject to attrition in structure-functions, it is a model system that can be analyzed at all levels of complexity, from changes at the molecular-genetic level to subjective reports on the results of its own activities."

Of particular interest would be to investigate the established phenomenon that with advancing age there is the tendency towards slowness in response as measured by perceptual, motor, and cognitive functions (see Birren, 1965; Botwinick, 1973; Fozard & Thomas, 1975; Welford, 1977) which reflects a basic change in the speed with which the CNS processes information (Birren, 1974). This aging fact is well documented in cross-sectional and longitudinal studies. What is not known is the extent of this relationship among the institutionalized elderly. It is assumed that this decrement in response patterns would be more pronounced. Nevertheless, it seems desirable to investigate this interaction in order to gain a better understanding of the aging process in the CNS among the institutionalized elderly.

Speed of response. Before proceeding a word addressing this construct is warranted. An inherent feature of this construct is psychomotor behavior and its relation to age.

Welford (1977) in summarizing earlier work (1968, 1976) outlines the human sensorimotor system and identifies three main central mechanisms involved in the chain of events occurring during motor performance. The sense organs, both external sources and internal receptors, receive the stimuli which in turn are analyzed and co-ordinated by the perceptual mechanism. This information is then passed through to the translation mechanism - so labelled because it translates this data into action by triggering a decision and computing a response. The orders for this response are then passed on to the last phase - the central effector mechanism - which programs a phased sequence of muscular actions to execute them (Welford, 1977, p. 450). Welford further elaborates that motor performance is definitively not dependent on motor factors alone but on activities in the whole system; he concludes that the main factors limiting motor performance among the aged seem to lie in the second and third mechanisms in the sequence of events - the translation and central effector mechanisms.

A major aim in this area of research, i.e., in the psychomotor performance and reaction speed in relation to aging, has been and is still today an attempt to pinpoint the sources of change noted in these performance areas. Evidence so far indicates that the limitations are not due to peripheral mechanisms. For example, in simple reaction time sensory or input factors do not account for the slowing in late life (Botwinick, 1971, 1972; Botwinick & Storandt, 1972) and neither do the neuro-

muscular transmission pathways explain the overall age difference (Birren & Botwinick, 1955). Likewise, the transmission time of both peripheral motor and sensory nerves is very minor in the total time taken by voluntary response in accounting for the slowdown with age (Norris, Schock & Wagman, 1953; LaFratta and Canestrari, 1963). Rather, the bulk of literature supports the notion that the main sources of limitations in these psychomotor performances lie in central mechanisms (for reviews see Birren, 1965, 1974; Botwinick, 1973; Fozard & Thomas, 1975; Welford, 1977).

Some of the most sensitive instruments employed in eliciting age-related changes in motor performance are simple reaction time (SRT) and disjunctive reaction time (DRT). SRT involves the presentation of only one signal and one corresponding response, whereas with DRT several different combinations of stimuli are presented, but with only one specific combination calling for a response. In SRT the signal and response are both known in advance, thus the occurrence of a signal initiates a previously prepared response. With DRT, the possibility does not exist for one to prepare the response in advance; rather, subjects must first identify which signal has occurred and then decide whether or not they should initiate a response. Both tests involve central stimulus-response integration including such components as readiness to respond, attention, and vigilance; and DRT includes a great deal of additional central processes such as sensory discrimination, decision-making processes, and motor discrimination (Botwinick, 1973; Talland, 1965; Welford, 1977).

Explanations cited regarding the lengthening of SRT with age are: cardiovascular impairments (Botwinick & Storandt, 1974; Simonson, 1965; Spieth, 1964, 1965), functional changes (Mathey, 1977), reduced physical fitness (Spirduso, 1975), and a lessened ability to maintain a state of readiness (Botwinick & Thompson, 1968; Ferris et al., 1976). This slowness with age is, however, not due to motivation (Botwinick, Brinley & Robbin, 1958; Weiss, 1965). With regard to DRT, in addition to the above-mentioned, impaired performance is attributed to the following: increased central processing time (Ferris et al., 1976; Jordon & Rabbitt, 1977; Simon & Pouraghabagher, 1978), age x task complexity (Jordon & Rabbitt, 1977; Simon, 1968), set expectation and increased inter- and intra-subject variability (Fozard et al., 1976; Waugh et al., 1973) and different strategies, i.e., the elderly work more within their capacity than at their limits (Rabbitt, 1965). Welford (1977) considers this last variable to be an aspect of cautiousness, and accordingly the elderly take more time to monitor their responses (Welford, 1977). Thus, it appears that SRT is more of an indicator of one's functional capacity, whereas DRT is both that and also a potential indicator of cognitive capacity.

Sex-related differences are equivocal. Noble, Baker & Jones (1964) reported significant age x sex DRT interactions: males were quicker until quite late in life. Botwinick and Brinley (1968) described similar findings, but later studies (Botwinick & Storandt, 1974; Botwinick & Thompson, 1966, 1967) showed that older women were slower than older men in SRT. This pattern was also reported by Mathey (1977): in both SRT and DRT women were slower, and these differences increased over time.

Additional evidence that speed of response or RT-type behavior is mediated by central mechanisms is provided by correlation analyses between speed of response and cognitive-perceptual behavior. Botwinick (1973) and Welford (1977) in extensive reviews both conclude that RT is important to, or a reflection of, cognitive abilities in later life. Mathey (1977) summarizes the relation between choice reaction time and the Hamburg-Wechsler Intelligence Test for Adults (HAWIE, 1956) reports significant correlations and interprets the relationship as "an indication that choice reaction time is a relatively complex measure related not only to narrowly defined intellectual functions, but also to general intellectual capacities and flexibility, including verbal intelligence."

In comparing the two types of measurements, greater changes with age occur in DRT than SRT. The main explanation of this is linked with the decision-making component of DRT and the fact that elderly subjects are more influenced by irrelevant material and variations in the time intervals between signals. In addition, older subjects need more time to monitor and inspect signals before responding. And since the signal and response are both known in advance in SRT, i.e., the subject does not have to make a decision after perceiving the stimulus, these factors do not influence SRT as they do DRT. Ferris et al. (1976) reported highly significant differences in terms of mean differences between SRT and DRT and the ratio between DRT and SRT (DRT/SRT) between normal elderly and impaired elderly (senile patients). They also reported that neither SRT or DRT was affected by the age or sex of the subject. They concluded that DRT is a reliable index of age-related mental decline. Thus, it appears essential to also examine the mean differences and ratio between SRT and DRT.

A question posed is what light this information can shed on the processes involved in an elderly institutionalized person's day-to-day interactions with his or her social and physical environment. Accepting the premise that a large part of the slow-down seems to be due to the decision-making component of RT, one possible importance stems from this fact. Since complex processes involve many decisions, and if each decision is slowed down by a fraction of a second, then the total slow-down could be quite considerable (Fozard & Thomas, 1975).

Secondly, information decays quite rapidly from the very short auditory and visual stores and from primary memory. A slow-down in processing thus means that in attempting to rehearse or process items in these stores, more items may be lost from memory for the older subjects. A quantitative time difference in processing rate can lead to a quantitative difference in number of items processed. This could then lead to a qualitative difference in complex task, since the older subjects may not be able to work with so many factors simultaneously. Any age-related differences in decision or basic processing time may thus underlie an age-related difference in memory and problem solving capabilities (Birren, 1974; Fozard & Thomas, 1975), which in turn may have carry-over effects on day-to-day activities.

The preceding referenced research has been carried out with healthy elderly volunteers, and hardly any data is available with regards to changes in reaction time as a function of institutionalization. Therefore the assessment of these functions offers the prospect for considerable scientific gain in understanding the behaviors tapped by the construct speed of response.

Statement of the Problem

Based upon this literature review, the following conclusions are formulated:

1. The institutionalized elderly represent a very select group among the elderly, and they are identified by a combination of demographic features and beset with various physical and/or mental disabilities.

2. A mixture of cross-sectional and longitudinal research designs provides a more optimal method for investigating this particular group.

3. There is a paucity of research findings referencing the effects of institutionalization on processes and functions mediated by the central nervous system (CNS), such as the speed with which the CNS processes information. This scarcity of data applies also to behavioral observations of general institutional functioning, e.g., self-care, sociability.

4 Little is known regarding the function of age in relation to the consequences of institutionalization on parameters such as the speed of response and behavioral observations of physical and social functioning.

5. Changes over time on the variables indicated in points 3. and 4. are not documented. Lacking is empirical data obtained by longitudinal methods regarding the stability or change (increment/decrement) over time on these variables.

It would therefore appear worthwhile to study the changes which may occur over time in the institutionalized old in relation to functions mediated by the CNS and behavioral observations of general institutional functioning. In addition, distinctions should be made

on the results obtained among the "young old" (61-70 years), "middle old" (71-80 years) and the "old old" (over 80 years) based upon time series measurements. By examining such relations, information may be obtained which provides more understanding concerning the aging process in the CNS during institutionalization.

Purpose of the study

The purpose of this study is to examine the relationship between institutionalization and (a) functions mediated by the CNS such as speed of response and speed of processing information, and (b) behavioral observations of general institutional functioning such as self-care and sociability. The study is both descriptive and exploratory in nature: descriptive in the sense that all residents in a nursing home for the aged will be screened and delineated by a battery of behavioral rating scales and psychometric instruments; exloratory in the sense that the proposed relationship will be investigated from a cross-sectional and longitudinal research design.

Operational definition of variables

Speed of response will be measured by various psychomotoric and performance tests. Indices of this will be length of the response times to simple and disjunctive reaction times, the number of problems completed in continuous performance tasks, and number of objects/figures recalled and recognized in visual memory tests. All tasks are indicators of the speed with which the CNS processes information. Therefore, differences found among the various subsamples or changes occurring over time within samples would reflect basic changes in the speed with which the CNS processes information.

Behavioral observations of general institutional and ward functioning will be assessed by ward doctors and nurses by means of behavioral rating scales. Indices of this will be physical and social functioning and performance of activities of daily living. Such evaluations are based upon direct observation of the patients' ward behavior over a prescribed period of time. The use of these ratings are subject to a number of constant errors: halo effect (the tendency to be unduly influenced by a single favorable or unfavorable trait which colors the rater's judgment of the patient's other trait), error of central tendency (the tendency to place persons in the middle of the scale and to avoid extreme positions), lencincy error (the reluctance to assign unfavorable ratings) (Anastasi, 1976; Wittenborn, 1967, 1972).

Emotional states will be evaluated by self-rating scales. Indices of this will be feelings of anxiety and mood depression and reflections of general life satisfaction.

Cross-sectional implies that age categories will be formed within this sample to compare and distinguish among those who might be called the young old (61-70 years), the middle old (71-80 years) and the old old (81-90 years).

Pacing tests will consist of two types: self-pacing tests are those in which the patients determine their own rate of performance; stimulus-paced tests are those in which the patients' responses are initiated and dependent on the appearance of a signal.

Learning rate would be defined as the mean difference between the first 30 second time segment and the last 30 second time segment on the continuous performance tests. These changes would be given in percentages.

Basic Assumptions and Hypotheses

In light of the existing literature dealing with this particular population, the following assumptions and hypotheses are stated. The first six are mainly applicable to the screening study:

1. There will be a high age-related incidence and prevalance of disease and disability.
2. Main diagnoses will be those attributed to or associated with diseases of the heart.
3. Visual and auditory impairments will increase with age.
4. Doctors' and nurses' behavioral ratings will reflect these assumptions.
5. With advancing age, there will be incremental increases in speed of response on the psychomotoric tests and decremental decreases on the performance tests.
6. Findings obtained from this sample on the various psychometric tests employed will vary substantially from those obtained from elderly community residents.
7. Regarding the longitudinal findings, it is assumed that behavioral ratings will suggest no change (stability) or a change in the direction of impairment.
8. Longitudinal performance findings will indicate a tendency towards a slowness of response and a gradual decrement in performance output.
9. There will be an increase in variance on the psychometric tests and a decline in learning rate from one assessment to the next.

METHODOLOGY

Setting

The study was performed in West-Berlin, Germany, at the Ida Wolff-Haus (IWH), a hospital for the chronically ill, elderly patient. The hospital complex consists of two main buildings. Building one, constructed in 1964, houses wards one through five and all medical and rehabilitation facilities, e.g., the surgical ward, the eye clinic, the dental clinic, X-ray and thermography department, physical therapy rooms and indoor swimming pool. Building two, constructed in 1971, houses wards six through nine and an occupational therapy room. On the top floor of each building is a canteen.

In building one the architectural design of the ward is U-shaped, whereas in building two the style is L-shaped. Located on each ward, in addition to the patients' quarters, are the nurses' offices and lounge, the patients' dayroom and the communal bathing and toilet facilities. In building one the staff's quarters are situated at the open end of the U near the staircases with the dayroom being at the other end. In building two, the staff quarters and dayroom facilities are next to each other at the intersection of the L. Also on each floor in building two are enclosed balconies on the two sides facing inward.

There are 477 beds distributed among the nine wards; wards one through six have approximately 50 beds each and ward seven through nine 60 beds each. In 95% of the patients' rooms there are five or six beds, and the remaining 5% are private or semiprivate rooms.

The wards are segregated and females reside on seven of the nine wards: wards 1,2,4,5,7,8, and 9. The determining factor regarding which ward new patients are assigned to depends only on where a free bed is, and not on the patient's health status or any other factor.

Patients, except those who are bed-ridden, are served meals in the respective canteen. The schedules for meals as with other activities, e.g., waking, visiting hours, social functions, rehabilitation therapy, are fixed and maintained. Visiting hours are twice daily, in the afternoon and early evening. The morning hours are reserved for physical therapy, occupational therapy or any other type of patient service that might be warranted. Two days a week there are planned social bus rides for ambulatory patients.

Ward personnel consists of a medical doctor, one head nurse, two or three practical nurses and three or four nurse's aids. All personnel are required to take courses dealing with various aspects of gerontology in relationship to their responsibilities. All educational training courses are conducted by certified personnel at the hospital.

Sample

Age and sex. In June 1977 the occupancy rate at the IWH was 97%, and approximately 90% of the patients, N = 417, were between the ages of 61 and 90. The age and sex distribution of this sample is shown in Table 2. The sample was divided into three age groups (a) 61-70 years; (b) 71-80 years; (c) 81-90 years. Also found in the Table are the age and sex distribution of men and

women 61 years and older, living in the FRG, divided into the same age groups (Statistisches Jahrbuch, 1979).

Characteristic of the IWH sample was the high proportional representation of patients (81%) over 70 years of age, and close to 45% of them were in their 80's. The age distribution, however, was not the same for males and females. For females, the distribution was negatively skewed with around 50% of them falling into group C, whereas for males there was more of a normal distribution with group B being represented by 47%. Thus, the proportion of females at the IWH increases with age but drops off for males. An additional feature of this sample was the high ratio of females to males (4 to 1). This sexual distribution concurred with results obtained in 1971 regarding the sex ratio of elderly patients living in institutional settings in the FRG. During

Table 2

Age and Sex Distribution

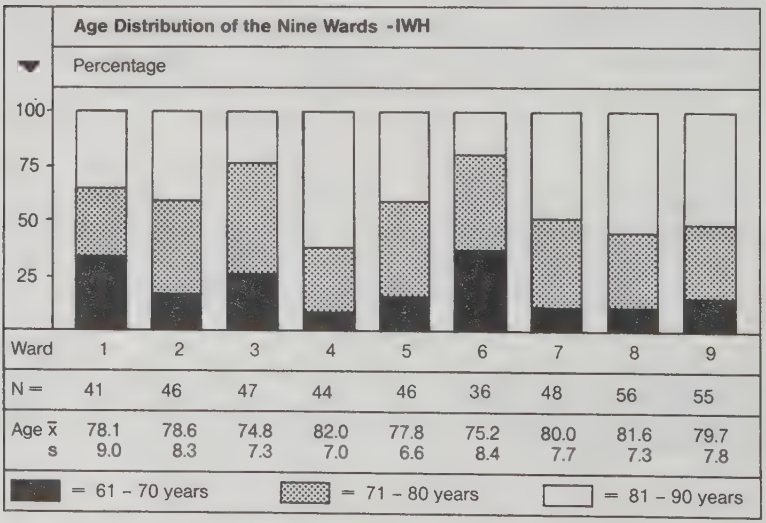
Age groups	Total Sample N = 417 (%)	Males N = 83 (%)	Females N = 334 (%)
	IWH		
61 – 70 years	77 (19)	25 (30)	52 (16)
71 – 80 years	160 (38)	39 (47)	121 (36)
81 – 90 years	180 (43)	19 (23)	161 (48)
	FRG*		
	%	%	%
61 – 70 years	51	54	50
71 – 80 years	38	38	38
81 – 90 years	11	8	12

* Statistisches Jahrbuch, 1979

this year there were 244,000 persons 65 years and older residing in institutional settings of whom approximately 75% were females (Statistisches Bundesamt, 1974). When comparing the age distribution of IWH with that of the FRG, there is, as expected, a sharp contrast. The age distribution of the FRG is positively skewed and almost reverses that of the IWH. In the FRG elderly females represented 62% of the entire population between the age of 61 and 90 years.

Table 3 presents the age distribution in percentiles of the nine wards at the IWH according to the three age groups. Also given is the number of patients per ward, their mean age and standard deviation. Wards three and six are the male wards. The mean age range of the nine wards was from 75 to 81, and both male groups were younger than the females. As is apparent, the majority of patients at the IWH were females in their 80's.

Table 3



Ward	1	2	3	4	5	6	7	8	9
N =	41	46	47	44	46	36	48	56	55
Age $\bar{x}$	78.1	78.6	74.8	82.0	77.8	75.2	80.0	81.6	79.7
s	9.0	8.3	7.3	7.0	6.6	8.4	7.7	7.3	7.8

= 61 - 70 years = 71 - 80 years = 81 - 90 years

Additional demographic data, e.g., family status, educational level and work background was gathered for the sample. This information was obtained by the ward doctor either with the cooperation of the patient or from medical records. Data classified in the next sections as "not clarified" implies that, for the area in question, the patient was unable to supply the required information and/or the related material was not listed in the patient's records. All information was compiled during the summer months, June and July, 1977.

Family status of the IWH sample and of institutional settings throughout the FRG are presented in Table 4. At the IWH over 60% of the sample were widowed, whereas 14% were single, 10% were married and 8% divorced. When contrasting males and females, a much higher pro-

Table 4

Family Status

	Total Sample N = 417 %	Males N = 83 %	Females N = 334 %
	IWH		
Single	14	21	11
Married	10	24	7
Divorced	8	16	7
Widowed	63	39	69
Not clarified	4	ø	5
	FRG* – Institutional Settings**		
	%	%	%
Single	36	38	36
Married	7	16	4
Widowed/Divorced	57	45	61

* 1971, in Die Lebensverhältnisse älterer Menschen, 1977

** Patients – 65 and older

portion of women were widowed and a smaller proportion of them were married. A comparison of the IWH with other institutional settings in the FRG indicates there are differences; notably there is a higher percentage of single persons in these settings. Also, widowed and divorced persons comprised 57% of the institutional population, but at the IWH they represented 71% of the sample (males = 56% and females 76%). Characteristic of both samples was the high proportion of persons who had no partner.

Education data are presented in Table 5. Over 75% of the sample finished Volksschule and only a very small percentage, 6%, continued onwards with additional education. No differences were found between males and females regarding their length of schooling.

Table 5

Education			
	Total Sample N = 417 %	Males N = 83 %	Females N = 334 %
Grade school	78	78	78
Jr. high school	4	3	4
Sr. high school	1	2	1
College	1	0	1
University	0	0	0
None	3	6	2
Not clarified	13	9	14

Occupational training. Over half of the sample received no formal job training or had only minimal on the job training for unskilled labor. It is noted, though, that more than 50% of these individuals were housewives. Approximately 31% received earlier on the job

training which involved some type of skilled labor training. A comparison of males and females shows that the males received more occupational training. These figures are shown in Table 6.

Table 6

Occupational Training			
	Total Sample N = 417 %	Males N = 83 %	Females N = 334 %
Unskilled	55	35	60
Skilled	31	55	25
Not clarified	14	10	15

Occupation. The various levels of the sample are listed in Table 7 and are categorized into unskilled, skilled, and white-collar labor. Approximately 13% of the sample were never employed as a result of physical and/or mental limitations. Fewer than 25% of them held jobs classified as unskilled, i.e., work not needing special training and close to 13% worked in occupations requiring

Table 7

Nature of Occupation			
	Total Sample N = 417 %	Males N = 83 %	Females N = 334 %
Unemployed	13	14	13
Housewife	31	–	39
Unskilled	22	27	21
Skilled	13	35	8
White collar	12	15	11
Not clarified	9	9	8

some type of job training. An additional 11% worked in white-collar professions, i.e., they were not engaged in manual labor. No sex differences were found in the areas unemployed and unskilled. In the skilled labor category a sex difference is evident, probably the result of the fact that more males were trained and worked in manual labor, e.g., as carpenters, plumbers, and construction workers.

In summary the demographic characteristics of the IWH sample were as follows:

Males: N = 83, $\bar{X}$ age 74.9, s.d. 8.1; approximately 47% were between the ages of 71 and 80 years. Over 75% were unmarried: 21% single, 16% divorced, 39% widowed. Close to 80% attended the Volksschule. About 55% received some type of occupational training and 50% of them were engaged in some type of skilled labor.

Females: N = 334, $\bar{X}$ age 79.7, s.d. 7.9, and around 50% were between the ages of 81 and 90 years. Roughly 88% were unmarried: 11% single, 7% divorced, 69% widowed. Close to 80% attended the Volksschule. An estimated 25% acquired specialized occupational training and 19% worked in the respective field. Approximately 40% were housewives.

Tests

Numerous psychometric instruments were employed to evaluate patients' behavioral and functioning status. Presented in this section is a description of the research tools utilized and, when available, the pertinent validity and reliability information as well as reference data.

Clinical Behavioral Rating Scales

The Nurses' Observation Scale for Inpatient Evaluation (NOSIE, Honigfeld, Gillis & Klett, 1966) is a widely used ward behavior rating scale. Factors contributing to the NOSIE's popularity are: (a) brevity, (b) easy rating of behavioral items, (c) evaluation of patients' strength as well as pathology, and (d) sensitivity to patient change (Honigfeld, 1974). The scale was originally designed for the evaluation of schizophrenic inpatients (Honigfeld & Klett, 1965), but has since been successfully employed as an assessment device for the geriatric population.

The NOSIE consists of 30 items assessed on a graded, frequency of occurrence rating format. The frequency of occurrence response categories are: (1) never; (2) occasionally; (3) sometimes; (4) often; and (5) always. Ratings are based on direct observations made during the three days preceding evaluation by the ward nurse.

Results from a series of factor analyses (Guy & Cleary, 1976; Honigfeld et al., 1966) clustered the items into seven factors:

Positive factors	Negative factors
Social competence (COM) 5 items	Irritability (IRR) 6 items
Social interest (INT) 5 items	Manifest psychosis (PSY) 4 items
Personal neatness (NEA) 4 items	Retardation (RET) 3 items
	Depression (DEP) 3 items

A composite score, total assets (TOT), is commonly used as a global indication of severity of status or as a gross index of change and is computed as follows:

150 + (sum of positive factors - sum of negative factors).

The scoring range is from 84 to 204, with lower scores indicative of more impairment. The composite scores and factors are employed as the indices of evaluation.

Regarding the validity of the scale, favorable evidence has been reported by Lentz, Paul & Calhoun (1971). Results show that their sample was on an average very comparable to the original older chronic geriatric group as far as total assets and all sub-scales are concerned, eexcept for social interest. In comparing NOSIE with other scales, Ludwig & Manx (1969) reported a correlation of +0.90 between NOSIE total assets and a ward behavior rating form.

Concerning the reliability of these scores, Lentz et al. (1971) reported the following high inter-rater reliabilities:

Factors	Inter-rater reliability
Total assets	0.95
Social competence	0.86
Social interest	0.95
Personal neatness	0.95
Irritability	0.83
Manifest psychosis	0.82
Retardation	0.83
Depression	not given

Reference data is available (Guy & Cleary, 1976) on a sample of some 400 subjects, all of whom were 60 years of age or older. The sample was divided into 4 groups: hospitalized schizophrenic group, hospitalized geriatric group (usually senile dementia), nursing home residents with a psychiatric diagnosis, and those without a psychiatric diagnosis. Profiles for these four samples in terms of mean factor scores are presented in Table 8.

These findings indicate that within the hospitalized groups, patients with geriatric diagnoses can be distinguished from their schizophrenic counterparts by their lower scores on the three positive NOSIE factors and total assets as well as their higher score on NOSIE-retardation. For nursing home residents, subjects with no psychiatric diagnoses generally present a less severe pathological picture than those with psychiatric diagnoses.

The Geriatric Rating Scale (GRS, Plutchik, Conte, Lieberman et al., 1970) is a ward behavior rating scale for measuring the degree to which geriatric patients are able to function, both physically and socially, in an intact, integrated manner. This scale is the revised form of the Stockton Geriatric Rating Scale (Meer & Baker, 1966).

The GRS consists of 31 items rated on a three point continuum per item (never, sometimes, always) from 0 to 2. All items are rated in the same direction, with higher ratings being indicative of a greater degree of functional impairment. Ratings are based on direct observations during the three days preceding evaluation by the ward doctor.

The scores from a sample of 575 subjects, 55 years and older, were pooled together (Guy & Cleary, 1976) and factor analyzed, a principal components analysis. The analysis yielded six factors which account for approximately 50% of the total variance. The factor compositions were as follows:

Social dysfunction	8 items
Aggressiveness	5 items
Incapacitation	9 items
Sleep disturbances	3 items
Sensory impairment	2 items
Work performance	2 items

A composite score, the sum of all items, is used as a global indication of severity of status or as an index of change. The scoring range is from 0 to 62. The composite score and individual factors are used as the indices of evaluation.

In terms of validity of the scale, scores established on the GRS differentiate geriatric and nongeriatric patients, and organic and functional geriatric patients (Dastoor, Norton, Biollat et al., 1975; Guy & Cleary, 1976; Plutchik et al., 1970). In addition, correlations between psychiatric evaluations of the level of functioning of patients and the composite GRS score was 0.86. No significant differences were found between males and females on the total GRS score (Guy & Cleary, 1976; Plutchik et al., 1970; Smith, Bright & McCloskey, 1977).

Regarding reliability, Salzman, Kochansky & Shader (1972), in their extensive review of rating scales for geriatric populations, noted that the GRS is reliable and valid and may have greater specificity and relevance for geriatric ratings than many other presently

employed scales. The inter-rater reliability of this scale ranges from 0.87 to 0.94 (Plutchik et al., 1970; Plutchik & Conte, 1972) and the correlation between ratings one year apart was 0.65 (Plutchik & Conte, 1972).

Reference data is presented on a sample of 400 subjects, 60 years and older, selected from studies pooled together from the Early Clinical Drug Evaluation Program (ECDEU) data bank, Biometric Laboratory, The George Washington University (Guy & Cleary, 1976). The sample was divided into four groups, and profiles in terms of mean factor scores are presented in Table 8.

Table 8

Profiles of Geriatric Samples* – Mean Factor Scores

		Hospitalized		Nursing Home	
		Schizo	Geriatric	Psychiatric Diagnosis	No Psychiatric Diagnosis
		N = 171	99	57	81
NOSIE	(Score range)				
Social competence	(5 - 25)	15.5	9	16.5	19.5
Social interest	(5 - 25)	10	8	12.5	13.5
Personal neatness	(4 - 20)	11.5	7.5	13	15
Irritability	(6 - 30)	14	18.5	15.5	11.5
Manifest psychosis	(4 - 20)	8.5	7.5	7.5	6
Retardation	(3 - 15)	8	10.5	8	8
Depression	(3 - 15)	4	4	5.5	4.5
Total Assests	(84 - 204)	152.5	134	155.5	168
GRS					
Social dysfunction	(0 - 2)	0.52	1.05	0.95	0.66
Aggressiveness	(0 - 2)	0.36	0.27	0.45	0.14
Incapacitation	(0 - 2)	1.10	1.53	0.99	0.76
Sleep disturbances	(0 - 2)	0.45	0.22	0.75	0.35
Sensory impairment	(0 - 2)	0.04	0.23	0.47	0.39
Work performance	(0 - 2)	1.31	1.73	1.60	1.59
Total score	(0 - 62)	18.3	26.1	27.0	21.0

* Guy and Clearly, 1976, p. 9

The scores for the hospitalized groups on the factor scores as well as the total score reflect greater pathology within this geriatric sample. Likewise, for the nursing home sample with psychiatric diagnosis, their total score is highest among the four groups and is indicative of greater severity of illness. Additional reference data on ambulatory patients has been reported by Plutchik et al. (1970) and Smith et al. (1977) and is presented in Table 9. Significant age differences were reported within both samples, but no significant differences were found between males and females on the total GRS score.

Both the NOSIE and GRS seem to be appropriate measures of geriatric functioning in inpatient situations. Both scales appear to be able to discriminate among geriatric subgroups and are more limited to inpatient populations. Additional commonalities are apparent. Notably, items on both scales are written in simple "nonpsychiatric" language, are rated on the basis of direct observation rather than interference, and therefore do not require the cooperation of the patient. The number of scale points differs, however: NOSIE items are rated on a

Table 9

GRS-Reference Scores

	Plutchik et al.,1970				Smith et al.,1978			
	N	Age*	Total Score $\bar{x}$	s	N	Age*	Total Score $\bar{x}$	s
Males	66	72	22.5	9.14	138	72	19.7	8.34
Females	141	77	24.6	10.33	232	76	21.5	10.13
Total	207	76	23.9	10.20	370	74	20.8	9.53

* Significance age difference = $p < 0.01$

5-point intensity scale, whereas the GRS uses a 3-point scale. While the greater number of scale points on the NOSIE permits greater discrimination, it also requires more precision on the part of the rater. Conversely, the GRS is simpler to rate but permits less subtle discrimination.

Additional comparative information was provided by Guy & Cleary (1976) who correlated the factor score of each scale in a subset of 344 patients in which concurrent ratings were available. They advise, though, that since the ratings of both the NOSIE and GRS were made on the basis of a common interview, some confounding of rating is to be expected, and, thus the correlations may be unusually high. This correlation matrix is illustrated in Table 10.

Social dysfunction (GRS) is highly correlated with all three positive factors of the NOSIE. These correlations are negative because of the scoring procedures utilized in the NOSIE. Reasonably high positive correlation is also obtained between GRS - Social dysfunction and NOSIE

Table 10

Correlation Matrix of GRS and NOSIE Factors and Total Scores* **N : 344**

	Positive			Negative				
NOSIE	COM	INT	NEA	IRR	PSY	RET	DEP	TOT
GRS								
Social Dysfunction	-.74	-.72	-.52	.11	.36	.56	.02	-.75
Aggressiveness	-.30	-.22	-.32	.41	.19	.11	.18	-.39
Incapacitation	-.70	-.48	-.63	.16	.21	.56	.17	-.68
Sleep disturbance	-.15	-.18	-.17	.22	.19	.13	.31	-.27
Sensory impairment	-.02	-.05	øø	.12	.21	.81	.15	-.08
Work performance	-.33	-.15	-.24	.15	.33	.40	.18	-.33
Total score	-.76	-.62	-.64	.25	.31	.60	.19	-.80

*Guy and Cleary, 1976 p. 9

- Retardation. GRS - Agressiveness correlates best with NOSIE - Irritability. GRS - Incapacitation, like GRS - Social dysfunction, tends to be negatively correlated with all three of the NOSIE positive factors and directly correlated with NOSIE - Retardation. The correlations of GRS - Sleep disturbance with the NOSIE factors are rather low and may be explained by the fact that there is only one specific item on sleep in the NOSIE. The highest of the correlations for GRS - Sleep disturbance, however, is obtained with NOSIE - Depression, which makes some clinical sense. GRS - Sensory impairment and GRS - Work performance correlated primarily with NOSIE - Retardation. The total scores of both scales are quite highly correlated and suggest that the scales yield similar results when rating subjects on a global basis. The two NOSIE factors of Manifest Psychosis and Depression, which are directly related to psychopathology, obtain the lowest correlations, with the GRS reflecting the deemphasis on psychopathology within that scale.

Testing procedures. The doctors assessed the patients with the GRS, and the head ward nurse rated the patients with the NOSIE. Doctors and nurses made their ratings during the same period of time, but independently of each other. They were instructed to base their responses on the patients' behavior on the three days preceding evaluation and not to collaborate with anyone. No special training is required on the part of the rater. However, all raters met on two occasions before the start of the study and discussed in detail their respective scales. In between these two sessions they were asked to rate three patients, and on the second meeting pilot ratings were discussed.

The Clinical Global Impression (CGI, National Institute of Mental Health, 1971) is a widely used rating scale to judge the patients' severity of mental illness in the context of the rater's experience with similar types of patients. The range of ratings is from 1 to 7. One is equal to normal, 4 indicates the patient is moderately ill and 7 indicates the patient is among the most extremely ill patients. Ward doctors make these ratings. There is no normative data for this scale and likewise, no information regarding the reliability and validity of this instrument.

The Arbeitsgemeinschaft für Geronto Psychiatrie (AGP, Ciompi & Kanowski, 1977) is used as a general documentation of psychiatric and somatic disturbances found among the elderly. The scale is divided into three main areas: psychiatric, bodily, and neurological disturbances. Areas assessed are memory and thought disturbances, personality and affective disorders, daily activities, psychomotoric disturbances, and general physical disturbances, such as visual and auditory difficulties. The AGP comprises over 200 items.

Areas are appraised on a four-point spectrum: not present, slight, moderate or severe. Ratings are made by the ward doctors and in some instances, e.g., daily activities, in collaboration with the ward nurses.

No normative data is available for the AGP. Reliability and validity studies have not yet been conducted. The authors stress, however, that the primary purpose of the AGP is to obtain a descriptive overview of the sample being studied.

Psychomotor and Continuous Performance Tests

Simple reaction time (SRT) involves (a) the presentation of a white light stimulus, (b) the recognition of the occurrence of the stimuli, and (c) the initiation of a response, e.g., pressing a telegraph-like key. The SRT test consists of two series of 14 white light signals. The time gap between signals varied; for half of them the interval was less than two seconds and for the other half the time lag was over five seconds. The length of each series was 1' 30", and there was a 30 second pause between the two series. All reactions were automatically recorded and displayed on a visual counter in milliseconds (msec.) and written down by the tester. Patients were not able to see their response time.

Disjunctive reaction time (DRT) involves (a) the presentation of different combinations of visual and auditory signals, (b) the recognition of the occurrence of a signal combination of white plus red light, and (c) the initiation of a response. The DRT test consists of two series of 16 signals, and randomized among them are eight combination signals. The time gap between signals varied. The length of each series and the pause were the same as in SRT.

Reference data of both SRT and DRT are presented in Table 11. All data was obtained at the Schering Research Laboratories, Berlin (West) FRG. The identical test apparatus was used. Information is presented on two age groups: young volunteers aged 21-35 and elderly volunteers aged 60-80. All volunteers were in good physical health and at the time of the study were not taking any psychotropic medication. Results presented here are the

scores obtained from the first two series in which the volunteers participated. All subjects had one training period before beginning with the first series.

On SRT the younger volunteers did not differ in their response times from the first to the second series. The elderly volunteers, on the other hand, had a 11% decrease from the first to the second series. This was applicable for both older age groups. Also apparent is that the younger volunteers were approximately 21% faster than the 60-69 year olds, and 28% faster than the 70-80 year olds. Within the elderly sample there were significant age differences: the 60-69 year olds registered shorter RT on both series at each testing session.

Regarding the DRT, a similar pattern was found. That is to say, the younger volunteers reacted faster on both series than the elderly subjects. In addition, there were significant age differences between the two older samples. This time, though, there was a slight decrease from the first to the second series found on the younger volunteers' DRT, while there was no apparent change within the elderlys' response patterns.

Results of other studies involving young male volunteers (Herrmann & McDonald, 1978; Herrmann, McDonald & Bozark, 1976, 1977) indicated no mean changes from one series to the next or from one week to the next in SRT, but consistent decreases in DRT. The authors interpreted this to mean that more learning is involved in DRT and this is reflected in decreased DRT. These findings are supported by the literature which indicates that DRT does depend to a greater extent on higher cognitive processes and decision-making functions.

Table 1)

Simple and Disjunctive Reaction Times - Reference Scores

Author + year	Sample	N	Age Range	SRT-1 X	SRT-1 S	SRT-2 X	SRT-2 S
1 Schering Research Laboratories, 1976-79	Volunteers	50	21-35	0.26	0.04	0.25	0.03
2 McDonald, et al., * in preperation	Elderly volunteers	49	60-69	0.33	0.07	0.29	0.05
				(1st week)			
				0.34	0.05	0.30	0.05
				(2nd week)			
				0.32	0.05	0.30	0.05
				(3rd week)			
		34	70-80	0.36	0.08	0.32	0.10
				0.36	0.07	0.33	0.08
				0.35	0.09	0.33	0.09
				DRT 1 X	DRT 1 S	DRT-2 X	DRT-2 S
1 Schering Research Laboratories, 1976-79	Volunteers	50	21-35	0.32	0.05	0.30	0.04
2 McDonald, et al., * in preperation	Elderly volunteers	49	60-69	0.42	0.05	0.42	0.05
				(1st week)			
				0.42	0.06	0.42	0.06
				(2nd week)			
				0.41	0.06	0.40	0.07
				(3rd week)			
		34	70-80	0.46	0.09	0.46	0.09
				0.44	0.07	0.45	0.08
				0.44	0.08	0.44	0.08

* Study conducted over three consecutive weeks

Testing procedures for RT tests. Patients were instructed to respond as quickly as possible by pressing down a telegraph key with the index finger of their dominant hand. They were also asked to rest their index finger on top of the telegraph key between signals. This was demonstrated at each testing session by the psychologist. Upon completion of the instructions all participants were asked if they understood

what they should do. A training period followed consisting of the presentation of one series of signals. This served as an adaptation period for the testees and provided an opportunity for the tester to observe the patients and see whether or not they were following the instructions. After this period the actual series began. SRT was always performed first and a one minute pause preceded the DRT test. The total amount of time needed for completion of both tests was 15 minutes. The index of evaluation for the SRT and DRT was the mean response of the 14 and 8 signals, respectively.

Numerical matching (NM) involves (a) the visual presentation of a number, (b) the identification of this number, and (c) the matching of it by punching-in the correct figure on a keyboard.

Simple addition (ADD) involves (a) the visual presentation of two numbers, (b) the performance of basic arithmetic operations and (c) the punching-in of the correct answer on a keyboard.

For both tests patients were seated in front of a typewriter-like apparatus which has three display windows; directly underneath the windows is a numerical keyboard from 0 to 9 (see appendix for illustration). In NM only one display window is lit, whereas in ADD all three are lit, and the one to the left shows the arithmetical sign.

Testing procedures for continuous performance tests.
Patients were instructed for NM to "punch in" on the keyboard with the index finger of their dominant hand the number displayed, and for ADD to perform the appropriate arithmetic computation. Upon completion of one problem, the next number appeared immediately. Patients

were told to work for both accuracy and speed. Before beginning it was explained and demonstrated by the tester what was required of them, and they were asked if they had understood everything. They were then allowed a 30-second adaptation period which was immediately followed by the three-minute testing period.

The number of problems attempted and correctly solved were automatically recorded for each 30-second period. The total time needed to complete each test was approximately five minutes. The mean number of problems attempted and correctly solved served as the index of evaluation. NM was always performed first and a one-minute pause preceded the ADD test. The total time needed for completion was approximately 15 minutes.

Comparison between the psychomotor and continuous performance tests. The psychomotor tests, SRT and DRT, are considered as stimulus-paced tests, and the continuous performance tests, NM and ADD, are viewed as self-pacing tests. In the former type of tests patients have no control over the rate of presentation. They are required to (a) maintain a state of alertness, (b) monitor the environment for the appearance of the stimuli, and (c) upon appearance, initiate a response. In self-pacing tests, the patients control the rate of presentation. That is to say, the stimuli is always present and they are instructed to work on a continuous basis at their own discretion. They are taught to control the apparatus and to use as much time as they like for studying the stimuli and preparing the response.

Features differentiating these types of tests are the nature of the instructions and the format employed for eliciting responses. The manipulation or variation of

such variables are reported to have effects on central processing (Atkinison & Shiffrin, 1968) and provide relevant information regarding how stimuli are being centrally processed and acted upon by the elderly (Arenberg & Robertson-Tchabo, 1977).

The Visual Memory Test (VMT, Adapted from 'Der Syndrom Kurztest', Lehrl et al., 1977) measures recall and recognition memory. Patients were presented a photograph which contains 12 animated-like figures/objects and were requested to read out loud the name for each figure. They were also informed that at a later time they would be asked to recall what they had seen. Patients were allowed one minute to view and memorize the figures and after a one-minute pause, asked to recall the objects (short term memory, STM). Seven to ten minutes later they were again asked to recall what they had seen (long-term memory, LTM). Following this, patients were presented a photograph which contains 36 animated-like figures and were asked to indicate verbally which figures they had seen before (recognition). For each test, patients were given one minute for responding.

Patients were given different parallel forms on each testing session. The range of possible scores is from 0 to 12. Reference data were obtained on a memory test using the identical format from a sample of elderly Germans (McDonald & Suchy, 1980). Scores on STM and LTM, respectively, were as follows: 55-64 years = 7.1 $\pm$2.16 and 6.3 $\pm$2.55; 65-75 years: 6.3 $\pm$2.26 and 5.3 $\pm$2.41. Regarding the sexes, males had scores of 6.8 $\pm$2.35 and 6.0 $\pm$2.66 on STM and LTM; and females 6.6 $\pm$2.18 and 5.6 $\pm$2.41 respectively. Significant differences were found only between the two age groups (p 0.01) on both tests. No data were obtained on the recognition test.

The Short Portable Mental Status Questionnaire, (SPMSQ, Pfeiffer, 1975) was developed to detect the presence of intellectual impairment and to determine the degree.

The scale consists of 10 items phrased in question form. All statements are read aloud and all responses are recorded. The number of correct responses is summed-up. The scoring range is from 0 - 10. A scoring system was developed to establish criteria for four distinct levels of intellectual functioning (Pfeiffer, 1975, p. 437). The following is applicable for elderly white persons with at least some high school education but not more than high school education:

	Number of correct responses	indicative of
1.	8 - 10	intact intellectual functioning
2.	6 - 7	mild intellectual impairment
3.	3 - 5	moderate intellectual impairment
4.	0 - 2	severe intellectual impairment

Pfeiffer (1975) suggests that both education and race may influence performance on the SPMSQ and must accordingly be taken into account in evaluating the score attained by an individual.

The validity of the SPMSQ included administering the test to 997 elderly persons residing in the community, to 141 elderly persons referred to a multipurpose clinic for psychiatric and other health and social problems, and to 102 institutionalized patients. Clear cut differences among the groups and comparison of the SPMSQ

results with the clinical psychiatric diagnosis tend to give face validity to the SPMSQ as a measure of detecting the presence and degree of intellectual impairment.

Test - retest correlations for two groups of aged subjects given the SPMSQ twice at four-week intervals were 0.82 and 0.83 (Pfeiffer, 1975).

Testing procedure. The SPMSQ was asked upon completion of the performance tests. All questions were read out loud by the tester and all answers were recorded. If the patient did not respond within 15 seconds the question was repeated. If no response was forthcoming, the tester proceeded to the next question. Patients were not allowed any aids, e.g., calendars, newspapers, birth certificates etc., and were not informed during the test if their response was correct or false. After the last question, they were thanked for participating and asked if they had any questions.

Coloured Progressive Matrices (CPM; Raven, 1938) is a primary mental ability test designed to measure fluid intelligence (Cunningham, Clayton & Overton, 1975). Raven refers to the CPM as "a test of observation and clear thinking" (1965, p. 3) and it indicates whether a person is, or is not, capable of forming comparison and reasoning by analogy; and if not, to what extent, relative to other people, he or she is capable of organizing spatial perception into a systematically related whole (1965, p. 12). In general, it can be seen that the CPM test is most sensitive to "functional fluctuations" in the output of intellectual activity (Raven, 1965, p. 20).

Table 12

Coloured Progressive Matrices – Reference Scores				
Author + year	Sample	N	Age	Score $\bar{x}$ s
1. McDonald + Suchy, 1980	elderly volunteers	652 590	55–64 65–75	26.5 7.9 22.9 8.9
2. Newcombe + Steinberg, 1964	psychiatric patients	21	69	21.9
3. Orme, 1957	volunteers	32 19	67 74	21.4 20.8
	patients (depression)	25	69	22.9
	(senile psychosis)	25	74	15.0
4. Raven, 1965	elderly volunteers	271	65 70 75 80 85	24 (Md.) 22 20 18 16
5. Rudinger, 1976	elderly volunteers (BLSA)		63–67 71–79	28 24,5

The CPM is comprised of three sets of matrices and each series has 12 brightly colored illustrations printed in a book. The matrices are presented individually and always in the same sequence, beginning with set A and proceeding, without interruption, to the end of the third set. This sequence must be followed, since the level of difficulty gradually increases, hence the name "Progressive Matrices". Each matrix has one missing section and below each diagram are six possible figures, one of which fills the empty cell in the matrix. Patients were instructed to choose the one which fills the matrix in such a way that it maintains a relationship extant among the figures of the other cells of the matrix. Upon completion of one task they proceed immediately to the next matrix. Patients were allowed six minutes to complete each set of matrices. Between each set, there was a one minute pause.

Regarding the reliability and validity of the CPM there is a scarcity of information available for an elderly population. What exists is applicable for children from the ages of 6 through 14 years (Raven, 1976; Schmidtke, Schaller & Becker, 1979).

Split-half coefficients for children vary from .49 to .91 and increase with age. Internal consistency comparing the subsets with the total for three different age groups (5 years to 11 years) were between .71 and .92. Test - retest correlations (after one year) for healthy and various diagnostic groups of children were between .72 and .84 (Schmidtke et al., 1979).

Concerning the validity of the CPM as an intelligence test, various opinions have been expressed (Guthke, 1970; Kurth, 1970; Brinkenkamp, 1975). Raven himself wrote "by itself it (CPM) is not a test of general intelligence" (1947, 1965, 1976). Cunningham et al. (1975) indicates CPM is a measurement of fluid intelligence. It was used as this index in the Bonn Longitudinal Study of Aging (Rudinger, 1976, p. 30). This construct, according to Horn, involves "the process of perceiving relationships, educing correlates, abstracting and problem solving as measured in both unspeeded as well as speeded tasks involving figural, symbolic or semantic content" (1975, p. 23). Regarding the validity of the CPM with other intelligence tests, correlations are consistently higher with performance subtests. Again, though, this is based mainly upon research carried out with children. Reference data may be found in Table 12. Age-related changes were reported by McDonald & Suchy (1980) and Raven (1965).

Self-Rating Inventories

The Befindlichkeits-Skala (state of well-being scale, BFS, Zerssen & Koeller, 1976; Zerssen, Koeller, & Rey, 1970) evaluates subjective feelings of mood changes and depressive states. It is a self-rating adjective checklist employed for the evaluation of one's present emotional/mood state.

The BFS consists of 28 pairs of descriptive antonyms, e.g., "I am feeling now more alert, more listless, neither - nor". The respondents are asked to decide which of the two words corresponds most closely to their state or way of feeling at that moment. If respondents are unable to decide, they indicate this by checking the column "neither - nor". The range of possible scores for this scale varies from a minimum score of 0 to a maximum score of 56. Low scores (0 - 15) indicate a state of well-being, intermediate scores (16 - 30) indicate moderate levels of unpleasantness and depression, and high scores (31+) reflect intense states of depression and sadness.

Standardization of the scale was carried out in the Federal Republic of Germany with healthy volunteers (N = 1,760) and various psychiatric diagnostic groups (N = 358) (Zerssen & Koeller, 1976). Regarding the reliability of the scale, the split-half and odd-even correlation coefficients were high: 0.94 and 0.87, respectively. Test - retest correlations varied considerably in patient groups from 0.65 to 0.91. This is expected, though, because if treatment is effective the difference is reflected in the change in the patient's BFS score.

The validity of the BFS scale regarding internal consistency for healthy volunteers and for psychiatric pa-

tients was 0.92 and 0.95, respectively. External validation was obtained by correlating doctors' clinical impression regarding depression with the BFS score for 180 hospitalized patients and with 28 hospitalized patients. The correlations were 0.85 and 0.90, respectively, (Schwartz & Strian, 1972; Zerssen, Strian & Schwarz, 1974). Correlation of the BFS with other validated scales (internal validation) is 0.6 and 0.7 for healthy subjects and psychiatric patients, respectively (Zerssen & Koeller, 1976), and with the Zung self-rating depression scale (1965) the correlation (N = 116) was 0.49 (Zerssen et al., 1970).

Standard values for a representative sample of German subjects (N = 1760) and various diagnostic groups are given in the manual (Zerssen & Koeller, 1976). Additional data have been obtained on two elderly samples, 55-75 years, of German subjects (McDonald & Suchy, 1980) and are presented in Table 13.

When contrasting the representative sample's score with the elderly, there seems to be hardly any difference between the age groups. Rather, differentiation on the BFS appears to be associated more with psychopathology.

Table 13

Befindlichkeits-Skala – Reference Scores

Author + year	Sample	N	Age	Score $\bar{x}$	s
1. McDonald et al., in preparation	elderly volunteers	49	60–70	7.7	7.0
		34	71–84	12.2	12.7
2. McDonald + Suchy, 1980	elderly volunteers	652	55–64	10.5	9.3
		590	65–75	12.6	10.5
3. Zerssen + Koeller, 1976	volunteers	1760	20–64	12.2	9.3
4. Zerssen, UNPB.	elderly volunteers	232	≥ 60	12.6	10.8
	psychotic patients	67	≥ 60	33.3	14.2

The State-Trait Anxiety Inventory (STAI-A State, Spielberger, Gorsuch & Lushene, 1970) evaluates subjective feelings of tension, nervousness, worry and apprehension, and heightened autonomic nervous system activity. The continuum of anxiety intensity measured by this scale varies from calmness to intense states of tension and fear (Spielberger, 1972, 1975).

The A-State scale consists of 20 statements, e.g., "I feel calm", "I feel nervous". Half of the items indicate the presence of an anxiety state and the other half reflect the absence of this state. The subjects are asked to indicated how they feel at the present time by responding to each statement by rating themselves on the following four-point scale:

1. "Not at all"
2. "Somewhat"
3. "Moderately so"
4. "Very much so"

The range of possible scores for this scale varies from a minimum score of 20 to a maximum score of 80. Low scores (20-35) indicate calmness and serenity, intermediate scores (36-55) indicate moderate levels of tension and apprehension, and high scores (56+) reflect intense states of apprehension and fearfulness that approaches panic (Spielberger, 1972, 1975). All patients were administered the modified version of the A-State scale (McDonald & Spielberger, 1980). Reference scores are found in Table 14.

Table 14

State Anxiety Inventory – Reference Scores

Author + year	Sample	N	Age	Score $\bar{x}$	Score s
1. McDonald et al., in preparation	elderly volunteers	49	60–70	30.7	6.8
		34	71–84	33.3	8.3
2. McDonald + Suchy, 1980	elderly volunteers	652	55–64	36.2	9.8
		590	65–75	35.5	10.9

The Life Satisfaction Index (LSI, Neugarten et al., 1961; Wieck, 1969) measures subjective life satisfaction of elderly people. The index consists of 19 statements about life in general, and subjects indicate whether they agree or disagree with the statements. Work carried out with this scale in the FRG shows it to be a reliable and valid means for measuring general and relative life satisfaction with no indication that social desirability is a biasing factor (Wiendieck, 1969). The higher scores suggest more subjective life satisfaction. Reference data were obtained from a sample of elderly Germans, 55-75 years (McDonald & Suchy, 1980). Mean values and s.d. obtained on the age group 55-64 were 13.6 $\pm$4.00 and for the 65-75 year age group 12.6 $\pm$4.16. These values differed at the p 0.01 level. Significant (p 0.01) sex-related differences were also found: males = 13.9 $\pm$3.66 and females = 12.5 $\pm$4.32.

Testing procedure. In order to insure a standardized testing procedure, all testers were trained how to administer the scales and the performance tests. The testing took place in a small comfortable room in which the patient was seated at a rectangular table facing the psychologist. The testing situation was arranged so that the psychologist could observe the patient's method of responding, but was not so close so as to make the patient feel uncomfortable.

For each test patients were informed about the content and what was expected of them. Detailed test instructions and procedures for the performance tests are found in the respective sections. The following text is applicable only for the self-report questionnaires, BFS, SAI, and LSI.

Patients were informed that they would be given a questionnaire containing statements or adjectives describing various emotional states. They were then given the forms and instructed to read the directions. Before beginning to respond to the inventory, the patients were asked if they had understood everything and were given an opportunity to ask questions. They were also reminded to respond to each statement according to how they felt "right now", and to answer every item.

If a patient indicated that he or she could not understand the meaning of a statement, or could not decide between the response choices, the patient was asked to reread the statement. If the statement remained unclear, or the patient could still not decide how to respond, the psychologist encouraged the patient to proceed to the next item.

After the patient had finished the first page, which consisted of 10 items for the A-State Scale and 14 items for the BFS, the psychologist quickly scanned the responses. For any items left unanswered, the patient was asked to respond to the omitted items, but the psychologist carefully avoided using language which implied that the patient must respond. Rather, the statements were phrased so that it was left up to the patient to decide what he or she wanted to do. It should also be noted that the psychologist did not read or evaluate the patient's responses during the testing session.

Measurement Points (MP)

There were five MP covering a span of two years from June 1977 until May 1979. Table 15 provides informa-

tion regarding the dates of the MP, the variable assessed at these testing sessions, and the number of patients evaluated at each session.

MP I

The study began in June 1977. As mentioned, one of the purposes of this investigation was to select a homogeneous sample of hospitalized patients for a clinical drug trial. Homogeneous implied that the sample manifests a similar degree of behavioral impairment and is able to complete a short battery of psychological performance tests. To accomplish this, a screening study was conducted to evaluate all residents living in the IWH.

During this phase of the study all patients were rated by their respective ward nurse and doctor with clinical rating scales, NOSIE and GRS. In addition, all patients were asked to perform various ability tests and to respond to a short mental status questionnaire. Those who verbally consented to participate were tested.

Table 15

Measurements Points (MP)					
MP Date	1 May '77	2 Nov. '77	3 Dec. '77	4 June '78	5 May '79
Tests					
Behavioral rating scales					
NOSIE	417		120	80	63
GRS	417	166		80	63
AGP	417				
CGI			120	72	
Performance tests					
SRT + DRT	250	166	120	80	63
NM + ADD	225		120	80	
SPMSQ	285				63
VMT			120	80	
CPM				69	
Self-rating scales					
BFS			120	80	
SAI			120	80	
LSI				76	

A detailed description of the above mentioned instruments and the testing procedures employed is given in the test section.

As indicated in Table 15, at MP I, two clinical behavioral ratings were made on 417 patients, and psychological test data were obtained on approximately 66% of this sample. Reasons why the remaining third did not take part were (a) physical handicaps, (b) mental limitations, and/or (c) declination of participation. The figures given in Table 15 for the SPMSQ, RT, and PPT are the number of patients who successfully completed the tests. Some patients were motivated and fully cooperative but were unable to grasp the meaning of what they should do, and thus never responded during certain parts of the test battery. Criteria employed as indicators of successful completion were as follows:

1. SPMSQ: patients must verbally respond to at least 50% of the questions.
2. RT: patients must react to at least 50% of the signals presented on each RT test.
3. CPT: patients must complete at least two problems every 30 seconds on the six trials in each test.

Based on the entire IWH sample: 69% successfully completed the SPMSQ, 59% the RT, and 54% performed satisfactorily on the CPT. The findings suggest that more had difficulty in solving numerical matching and addition problems than in reacting to simple and disjunctive stimuli or in answering questions dealing with recalling names, places, past events, etc.

MP II

The second phase of the study, MP II, was carried out five months later during the first part of November 1977. Patients considered for inclusion in MP II had to meet the following criteria:

1. They had received an overall clinical rating from both their nurse and ward doctor indicative of slight to moderate behavioral impairment. This was based upon the global score of the NOSIE and GRS.

2. They had responded to at least 50% of the signals presented in each of the RT series, two simple and two disjunctive.

Accepted for inclusion in the second part of the study, MP II, were 220 patients. A comparison of the patients included in MP II (the tested sample) with those excluded (the non-tested sample) shows that the proportional representation of the three age groups and both sexes re-

Table 16

Age and Sex Distribution -IWH

Age Cohorts	Tested Sample		
	Total Sample N = 220 (%)	Males N = 40 (%)	Females N = 180 (%)
61 – 70 years	40 (18)	14 (35)	26 (14)
71 – 80 years	86 (39)	18 (45)	68 (38)
81 – 90 years	94 (43)	8 (20)	86 (48)
	Non-Tested Sample		
	N = 197 (%)	N = 43 (%)	N = 154 (%)
61 – 70 years	37 (19)	11 (25)	26 (17)
71 – 80 years	74 (38)	21 (49)	53 (34)
81 – 90 years	86 (45)	11 (25)	75 (49)

mained more or less the same as in the total sample. The age and sex distributions of the tested and non-tested samples are found in Table 16.

Data, however, were obtained on only 166 patients at MP II. The causes for this reduction (drop-outs) are listed in Table 17. As can be seen, the tested sample was reduced by 54 persons (25%) in less than six months. In all, 31 subjects (57%) passed away; 11 subjects (20%) were discharged from the IWH; and 12 subjects (22%) declined to take part. During MP II only two variables were assessed: GRS and RT.

The primary aim of MP II was to determine whether the degree of behavioral impairment as measured by the ward doctors' rating had changed, and secondly, to see whether there was an increase in the mean response time for both simple and disjunctive RT. Any change indicative of more impairment or lengthening of psychomotoric response warranted exclusion from further investigations. This was in compliance with the inclusion criteria for the clinical drug trial.

Table 17

Dropouts				
between (MP)	1	2	3	4 5
	N	N	N	N
Reasons				
Passed away	31	3	6	17
Discharged	11	0	3	2
Medical reasons	ø	25	3	ø
Refused to participate	12	14	27	3
Missing data	ø	6	ø	ø
Total	54	48	39	22

MP III

Approximately one month later, December 1977, the third phase of the study was begun. MP III was the pre-evaluation period for the drug trial. The primary objective of the drug trial was to determine the effects of lisuride hydrogen maleate (LHM), a new synthetic ergot derivative (Gräf, Neumann & Horowski, 1976) in chronic elderly patients on cognitive and behavioral parameters. The design was a double-blind, placebo comparison investigation. Various scales and performance tests were used to evaluate the drug's efficacy and are listed in Table 15, under MP III. The duration of the trial was 16 weeks of active medication or placebo followed by a 4-week placebo period (drug-wash-out period). Patients with the following medical diseases, as diagnosed by the ward doctor, were excluded: multiple sclerosis, Parkinson's disease and internal diseases, e.g., severe decompensated heart failure, dysrhythmia, endocrine disorders, and gastrointestinal diseases.

As shown in Table 15, under MP III data were collected on 120 patients. Thus, the sample was reduced by 48 patients (29%) between MP II and MP III. The reasons are given in Table 17 Drop-outs. In all, 3 patients (2%) died, 25 (16%) were excluded for medical reasons, 14 (8%) refused to participate, and 6 patients' (4%) behavioral impairment level deteriorated.

MP IV

In June 1978, one year after the study began, MP IV was conducted. This assessment session began one month after active medication stopped. None of the patients, staff or testers, however, were aware of this fact. The psychometric instruments employed during this MP were the same as in MP III, and the CPM was also administered. During the time-interval between MP III and MP IV the

sample decreased again by 39 patients (32.5%).The causes, as shown in Table 17, were that 6 patients (5%) died, 4 (3%) left the hospital, 3 (3%) were excluded for medical reasons, and 27 (23%) dropped out of their own accord, mainly because they did not want to continue.

MP V

The final assessment was conducted in May 1979, approximately two years after the study began. During this phase all remaining patients were evaluated with clinical rating scales, and were tested on the RT tests and given the SPMSQ. As indicated in Table 15, data was collected on 64 patients. Thus, in a span of one year from MP IV to MP V, the sample size was reduced again by 19 patients. The causes leading to this reduction were: 13 patients died, 3 were discharged, and 3 did not want to continue

Consequently, in a time period of two years the initially tested sample of 220 patients was reduced considerably. In all, the accumulative reduction of over 70% during this period was caused by: 53 patients (24%) passing away; 16 patients (7%) being discharged; 25 patients (11%) being dropped for medical reasons, and 56 patients (26%) declining of their own accord to participate further.

Statistical Procedures

The classical analysis of variance model with two or three factors and a repeated factor (time)(Scheffe, 1959; Winer, 1971) was utilized. The Statistical Program System for Social Sciences for the analysis of variance (Kim & Kohout) was used. The behavioral rating scales were analyzed according to the following: non-tested and tested; age (three levels: 61-70 years, 71-80 years, 81-90 years); and sex. The psychometric tests were analyzed according to the factors age and sex, and the longitudinal findings according to the factors age and time.

Results

The results are presented in three sections. Section one addresses the cross-sectional findings. Section two describes the longitudinal findings. Section three compares the findings of the survivors and non-survivors, and length of hospitalization.

Cross-Sectional Findings

This section deals with the findings obtained on the various psychometric instruments administered at MP 1 (see page 87, Table 15). Results are presented individually for the tests and are graphically illustrated in tables and figures. Descriptive statistics and findings of the ANOVA are reported focusing on non-tested and tested samples, the three age groups, and males and females. This approach facilitates comparisons between and within the samples. Results are presented firstly on the behavioral rating scales and secondly on the results of the performance tests.

The conclusion of this section presents and compares the results of the tested sample (see MP II through IV pp. 89-92) subdivided according to patients' attrition (see Table 17, "Dropouts", p. 90). Results are presented on the following four subgroups:

1. group 1: completed tests at MP I, N: 54
2. group 2: completed tests through MP II, N: 40
3. group 3 completed tests through MP III, N: 39
4. group 4 completed tests through MP IV, N: 80

Behavioral Rating Scales

The Nurses' Observation Scale for Inpatient Evaluation

Table 18 presents the mean values and standard deviations of the NOSIE ratings obtained at MP 1. These profiles are given for the sample subdivided into the following groups: non-tested and tested groups, three age groups, and males and females. The scores are listed individually for the three positive factors, the four negative factors and the total assets score. The positive and negative scores reflect the nurses' evaluation of patients' strengths as well as pathology. The respective factor scoring ranges are found below each factor with higher positive scores indicative of more patient strength, whereas the higher negative scores reflect greater pathology.

Table 19 presents the results of ANOVA. Listed below each factor and the total asset score are the computed F-ratios derived for the three factors: non-tested/tested, age and sex, and the respective interactions. Significant effects, $p < 0.05$ and $p < 0.01$ are indicated.

Non-tested and tested-related differences were obtained between these two groups. Nurses rated the tested group higher on all three positive factors: social competence, social interest, personal neatness, total assets; and lower on three of the four negative factors, irritability, manifest psychosis, and retardation. The difference, though, was greater on the positive factors. Items forming the positive factors were rated as being characteristic more often of the tested sample, but characteristic only sometimes of the non-tested sample. This is based upon the frequency of occurrence rating format. Items making up the negative factors, however, did not differentiate the two groups to the same degree and were rated as occurring less than occasionally for the tested sample and occasionally for the non-tested sample.

The findings were supported by the ANOVA, Table 19, which yielded significant differences between the two groups on the three positive factors, on three of the negative factors, and likewise on the total assets score. All three positive factors, the total assets score, and two of the negative factors, were significant at the 1 percent niveau.

Age-related differences were not visible among the three age groups; rather, there was a striking similarity in terms of mean factor scores among the groups on the NOSIE ratings. These profiles are illustrated in Table 18. Nurses rated the three age groups in the same manner, e.g., social competence items were considered as being often characteristic of all age groups, whereas items reflecting social interest and personal neatness were considered to be sometimes typical behavior of the three age groups. Such patterns were also apparent for the ratings of the negative factors, i.e., nurses rated these items as being occasionally indicative of the three age group's behavior.

These observations were documented by the ANOVA, Table 19. No marked differences were found among the three age groups, and only one factor, irritability, yielded a F-ratio exceeding one point.

Sex-related differences were apparent on one positive factor and two negative ones. Nurses rated females higher on the positive factor, social interest, and likewise on the negative factor, depression, and lower on the retardation factor. Significant sex differences were found on these three factors, two were at the 5 percent niveau. Nurses rated females higher on social interest and depression, and lower on retardation.

Table 18

NOSIE – Profiles of the Sample

Groups		Non-tested	Tested	61-70 years	71–80 years	81–90 years	Males	Females
N		197	220	77	160	180	83	334
Factors (score range)								
Positive								
Social competence	$\bar{X}$	16.9	21.3	19.4	19.0	19.3	18.9	19.2
(5 - 25)	S	5.12	4.07	4.69	5.28	4.93	5.85	4.84
Social interest	$\bar{X}$	13.2	17.1	15.9	15.4	15.1	14.4	15.5
(5 - 25)	S	4.80	4.99	5.08	5.36	5.25	5.67	5.13
Personal neatness	$\bar{X}$	10.0	14.7	12.0	12.4	12.7	11.7	12.6
(4 - 20)	S	5.53	4.98	5.76	6.03	5.57	6.44	5.58
Negative								
Irritability	$\bar{X}$	11.7	10.4	10.8	11.5	10.6	11.6	10.8
(6 - 30)	S	5.89	4.56	4.97	5.86	4.68	5.58	5.14
Manifest Psychosis	$\bar{X}$	6.9	4.9	5.8	5.9	5.9	5.8	5.9
(4 - 20)	S	4.18	2.19	3.49	3.43	3.26	3.20	3.50
Retardation	$\bar{X}$	10.9	8.2	9.4	9.5	9.5	10.3	9.4
(3 - 15)	S	3.48	3.38	3.40	3.75	3.76	3.65	3.65
Depression	$\bar{X}$	4.6	4.7	4.7	4.6	4.7	3.6	5.0
(3 - 15)	S	2.04	1.99	2.06	2.10	1.87	1.30	2.10
Total assets	$\bar{X}$	155.7	174.9	166.6	164.9	166.4	163.5	166.0
(84 - 204)	S	22.0	18.7	20.7	23.4	22.1	23.4	22.1

Table 19

NOSIE – Age x Tested x Sex ANOVA – F Ratios

Factors▲ =	COM	INT	NEA	IRR	PSY	RET	DEP	TOT
Effects								
Age (A)	0.47	1.00	0.75	1.15	0.05	0.28	0.79	0.35
Tested (T)	89.95*	56.80*	81.25*	5.48^{+}	39.31*	64.54*	0.11	85.77*
Sex (S)	0.01	4.28^{+}	0.34	0.72	0.33	4.40^{+}	33.01*	0.32
A x T	3.34^{+}	1.71	2.30	1.18	1.51	0.79	0.88	3.00^{+}
A x S	2.00	0.09	1.16	2.19	0.46	0.77	0.55	0.62
T x S	1.05	0.23	0.01	0.66	0.33	0.06	0.05	0.17
A x T x S	0.31	0.34	0.48	1.56	0.30	0.53	0.17	0.40

$^{+}$ = $p < 0.05$
* = $p < 0.01$

▲ Abbreviations

COM = Social competence
INT = Social interest
NEA = Personal neatness
IRR = Irritability
PSY = Manifest psychosis
RET = Retardation
DEP = Depression
TOT = Total assests

Interaction effects were found between age and non-tested/tested components on the positive factor social competence and total assets score. This interaction appears to be the result of the lower rating obtained by the 71-80 year age group in comparison with the similar ratings obtained by the other two age groups within the non-tested group. The interaction effect of the total assets indicated that within the tested sample the score increased sightly with age whereas within the non-tested sample, the middle age group's composite score, was somewhat lower.

The Geriatric Rating Scale (GRS)

Table 20 presents the mean values and standard deviations of the sample based upon the GRS ratings made at MP 1. These profiles are given for the sample subdivided into the same groups as with the NOSIE ratings: non-tested and tested, three age groups, and sex. Scores are listed individually for the six factors as well as for the total score. The score reflects the doctors' evaluation of patients' level of physical and social functioning. The factor score range on each one is 0 - 2, with higher ratings indicative of more functional impairment.

Table 21 presents the results of ANOVA. Listed below each factor are the computed F-ratios derived for the three factors: non-tested and tested, age, and sex and the interactions between the factors. Significant differences are given.

Non-tested and tested-related differences were found. Doctors rated the tested sample lower on every factor, and likewise the composite score was considerably lower. Doctors assigned the tested sample lower ratings on items reflecting social dysfunction, incapacitation,

work performance, sleep disturbance, and sensory impairment. The factor agressiveness was not considered by the doctors as an area of impairment for either group and was rated almost always as being not present among the patients. The largest variance, though, was obtained on the items comprising the factors social dysfunction and incapacitation.

These results were demonstrated in the ANOVA (Table 21). With the exception of the factor aggressiveness, significant differences were recorded on every factor as well as on the total score. The differences were consistent and always favored the tested sample. Four factors and the composite score reached the 1 percent niveau and the factor work performance was significant at the 5 percent level.

Age-related differences were found for two of the six factors (Table 20):social dysfunction and sensory impairment. Doctors rated the young old lower on social dysfunction than the other two age groups, and likewise assigned the middle old lower ratings than the old old. Regarding sensory impairment, doctors ranked the young old group lower in this area in comparison with the other two age groups who did not differ from one another. Other tendencies noted were in the areas of sleep disturbances and work performance; in both instances the ratings favored the younger age group. This trend was also reflected in the cumulative scores where the young old received the lowest and the old old the highest composite rating.

The results of the ANOVA (Table 21) yielded two significant differences among the three age groups : social dysfunction and sensory impairment. On both factors the signficance was at the 1 percent level.

Table 20

GRS – Profiles of the Sample								
Groups		Non-tested	Tested	61–70 years	71–80 years	81–90 years	Males	Females
N		197	220	77	160	180	83	334
Factors								
Social dysfunction	$\bar{X}$	1.22	0.77	0.78	0.93	1.04	0.84	0.99
	S	.53	.47	.51	.55	.56	.55	.55
Aggressiveness	$\bar{X}$	0.10	0.07	0.08	0.08	0.08	0.07	0.08
	S	.22	.14	.17	.20	.16	.17	.19
Incapacitation	$\bar{X}$	0.94	0.47	0.62	0.68	0.70	0.57	0.72
	S	.59	.41	.43	.53	.58	.51	.55
Sleep disturbance	$\bar{X}$	0.33	0.13	0.15	0.22	0.26	0.23	0.23
	S	.49	.31	.37	.41	.44	.36	.44
Sensory impairment	$\bar{X}$	0.65	0.36	0.24	0.52	0.56	0.42	0.53
	S	.64	.47	.40	.60	.54	.49	.60
Work perfomance	$\bar{X}$	1.87	1.77	1.71	1.83	1.85	1.66	1.87
	S	.32	.45	.50	.39	.35	.45	.36
Total score	$\bar{X}$	25.3	15.3	16.5	19.8	21.0	17.5	20.7
	S	11.11	8.05	8.64	10.98	10.90	10.65	10.71

Table 21

GRS – Age x Tested x Sex ANOVA – F Ratios							
Factors▲=	DYS	AGG	INC	DIS	IMP	PER	TOT
Effects							
Age (A)	4.76*	0.35	0.20	2.09	7.62*	1.96	2.75
Tested (T)	82.70*	2.75	71.70*	23.40*	21.80*	4.09+	90.99*
Sex (S)	4.12+	0.75	8.50*	0.00	1.85	14.26*	6.67*
A x T	1.55	1.49	1.05	2.69	0.77	1.57	2.40
A x S	1.41	1.00	0.40	0.56	0.46	0.76	0.51
T x S	4.21+	1.57	2.45	1.50	1.69	0.32	3.24
A x T x S	0.94	0.69	0.26	0.41	0.01	1.07	0.72

+ = $p < 0.05$
* = $p < 0.01$

▲ = Abbreviations

DYS = Social dysfunction DIS = Sleep disturbances PER = Work performance
AGG = Aggressiveness IMP = Sensory impairment TOT = Total score
INC = Incapacitation

Sex-related Differences were evident but were not as pronounced as the non-tested/tested ones. Profiles for males and females in terms of mean factor scores and standard deviations are presented in Table 20. On four factor scores: social dysfunction, incapacitation, sensory impairment, work performance and composite score, males obtained lower ratings than their counterparts.

These findings were supported in the ANOVA, Table 21. Significant sex-related differences were found on the factors social dysfunction, incapacitation, work performance and total score. All parameters except social dysfunction were significant at the 1 percent level.

The Arbeitsgemeinschaft für Geronto Psychiatrie (AGP)

Tables 22 through 26 present the findings obtained with the AGP at MP 1. Data is presented only on those symptoms in which at least 25% of the sample were perceived as experiencing the disturbance in question. Difficulties were categorized under the following subheadings and are reported upon in this sequence: cognitive processes, self-care competency and activities of daily living, emotional states, bodily functions and medical diagnoses. Descriptive statistics in terms of percent distributions are given for the response categories "none", "slight", "moderate" and "severe". Tests to determine if significances existed among the various groups in relation to their degree of severity were not computed.

Cognitive Processes. Table 22 presents the proportion of patients experiencing some degree of difficulty with certain cognitive processes. These distributions are presented separately in sequence for the non-tested and tested groups, the three age groups, and males and females.

Approximately 35% of the non-tested and 30% of the tested group were rated as having, to some degree, difficulties with short-term memory and slightly less as having difficulties with long-term memory processes. The factor differentiating the groups was the breakdown regarding the degree of severity: in both instances a higher percentage of non-tested patients was rated as having either moderate or severe memory disturbances. With regards to comprehension and concentration, roughly 45% of both groups were not experiencing difficulties of this nature. Of those who were, the non-tested sample, on the average, were assigned ratings indicative of more impairment in these areas. Concerning thought disturbances, a slightly higher percentage of non-tested patients were in comparison with the tested sample considered as having no difficulties in the area of slowed or restricted thinking. The groups differed in the distribution of difficulty: the non-tested sample had more individuals listed as having severe thought disturbances, whereas the tested group had more individuals experiencing only slight thought disturbances.

Age differences regarding memory disturbances were not so apparent. With increasing age there appears to be a slight increment in the percentage of patients experiencing both short-term and long-term memory disturbances. The same pattern was observed regarding the areas comprehension and concentration; that is to say, more patients in the age range of 81-90 years were rated as having some degree of difficulty with these functions.

An inspection of the percentiles reveals that among the old old there were more patients who were having moderate disturbances in these areas. Regarding thought disturbances, no outstanding disparities were found. An equal

Table 22

Cognitive Processes – Profiles of the Sample								
Groups		Non-tested	Tested	61–70 years	71–80 years	81–90 years	Males	Females
N		197	220	77	160	180	83	334
Memory disturbances		%	%	%	%	%	%	%
Short-term memory	none	64	70	73	71	65	83	64
	slight	8	13	11	10	10	8	12
	moderate	11	10	9	8	12	5	10
	severe	18	5	5	10	9	4	12
Long-term memory	none	68	77	81	75	70	81	72
	slight	10	9	9	9	14	6	11
	moderate	9	6	8	6	9	7	8
	severe	11	3	3	9	6	4	8
Comprehension	none	44	46	49	47	42	57	42
	slight	20	30	25	26	22	20	26
	moderate	18	16	15	14	22	17	17
	severe	18	6	10	13	12	5	14
Concentration	none	43	41	47	43	39	56	39
	slight	18	29	22	26	19	16	25
	moderate	21	21	20	17	27	21	22
	severe	18	9	11	13	14	7	15
Thought disturbances								
Slowed thinking	none	50	42	46	51	44	61	42
	slight	11	25	18	18	17	15	19
	moderate	21	25	18	20	28	16	24
	severe	18	8	19	13	11	8	15
Restricted thinking	none	64	58	53	61	61	50	62
	slight	7	16	18	11	11	22	9
	moderate	14	17	19	16	15	17	16
	severe	15	8	10	13	12	11	12
Fuzzy thinking	none	72	74	66	77	71	68	73
	slight	7	12	15	7	11	16	9
	moderate	11	13	14	11	12	15	11
	severe	9	2	5	4	5	1	6

number of patients from the three age groups were not experiencing thought disturbances in terms of slowed or restricted thinking. Those who were did not differ from one age group to the other with regards to the degree of their severity.

Sex-related differences were more pronounced on the cognitive processes evaluated. In every paramter except two, restricted and fussy thinking, a larger proportion of males were assessed as not having difficulties with the particular function in question in comparison with females. These disparities were quite evident in the areas of short-term memory, concentration and slowed thinking.

Self-Care Competency and Activities of Daily Living.

Table 23 presents the proportion of patients in need of assistance of basic nursing services by type of the different daily activities. These percentages are given separately for the non-tested and tested groups, the three age groups, and males and females.

Approximately 40% of the non-tested and tested groups were not in need of assistance with dressing, walking, washing, and eating. Also, around 55% were viewed as having no difficulties in busying themselves or socializing with one another. In addition, roughly 40% were not incontinent and were never confined to bed. The factor differentiating the non-tested and tested groups was the degree of difficulty which the groups were having in executing these basic self-care skills. Of the remaining 60%, the vast majority of the tested group was labelled as having slight to moderate difficulties in performing these activities, whereas the non-tested group was considered as having moderate to severe difficulties with the same tasks. Thus, the same percentage of non-tested and tested patients were in need of assistance; however, the degree of the severity varied markedly between the two.

Regarding the distribution of the age groups, the ratio of those not in need of help did not vary considerably among the three age groups. The range in most instances was around seven percentage points The breakdown according to the three levels of difficulties was also fairly

Table 23

Self-Care Competency and Activities of Daily Living - Profiles of the Sample								
Groups		Non-tested	Tested	61-70 years	71-80 years	81-90 years	Males	Females
N		197	220	75	160	180	83	334
Difficulties with		%	%	%	%	%	%	%
Dressing	none	37	37	34	39	38	50	34
	slight	5	17	11	9	13	9	11
	moderate	27	29	32	32	25	33	28
	severe	31	16	23	20	24	8	27
Walking	none	39	40	38	43	40	55	37
	slight	12	19	17	13	18	13	16
	moderate	14	20	15	18	17	15	18
	severe	35	21	30	26	26	17	30
Washing	none	38	40	38	41	41	55	36
	slight	5	18	11	9	13	14	10
	moderate	32	32	32	37	30	24	35
	severe	25	10	19	13	17	7	19
Eating	none	42	44	41	48	44	59	40
	slight	23	44	37	29	36	27	35
	moderate	21	11	15	18	12	13	15
	severe	13	1	8	5	8	1	3
Busying oneself	none	53	53	46	53	56	51	53
	slight	5	14	13	7	8	6	10
	moderate	10	14	19	13	11	21	11
	severe	33	19	23	27	26	22	27
Socializing	none	56	54	48	55	58	55	55
	slight	7	21	18	14	13	20	13
	moderate	9	9	14	9	10	9	10
	severe	28	16	20	22	20	16	23
Incontinent	none	38	38	34	40	39	50	35
	slight	12	26	22	18	16	8	21
	moderate	8	8	8	6	11	7	9
	severe	42	29	37	35	33	35	35
Bedridden	never	37	38	32	42	39	52	35
	sometimes	11	18	20	13	14	11	16
	often	25	33	30	28	30	30	28
	always	26	12	18	18	17	7	21

compatible. All age groups were experiencing moderate to severe difficulties in dressing, walking, washing, busying oneself, and socializing, but having only slight to moderate problems in eating. In addition, roughly one-third were severely incontinent. If anything, the 61-70 year old group was considered to be in need of assistance with these daily activities slightly more than the other two age groups.

Males, on the average, were in less need of assistance than females. Between 50% and 55% of the males were not considered as having difficulties, whereas around 35% of the females were viewed in the same manner, except for the variables busying oneself and socializing. Of the males having difficulties the majority had moderate problems with dressing and washing. With the females over 50% were having moderate to severe difficulties with dressing, walking, and washing, and in turn, were often confined to bed.

Emotional States. Table 24 presents the proportion of patients experiencing emotional disturbances and reduced social contact. These distributions are presented for the three categories: non-tested and tested, age, and sex.

The vast majority of patients, regardless of the category, were not thought to be experiencing difficulties of restlessness, depression or anxiety.Differences within the respective groups were more apparent between males and females. Regarding the first two categories, over 75% were not restless or depressed, and 70% were not anxious. Those who were experiencing one of these difficulties were, in most instances, assigned a rating of slightly. Males, on the whole, were hardly ever considered as having problems in these areas, while approxiately 70% of the females were.

Table 24

Emotional States – Profiles of the Sample								
Groups		Non-tested	Tested	61–70 years	71–80 years	81–90 years	Males	Females
N		197	220	77	160	180	83	334
		%	%	%	%	%	%	%
Restlessness	not at all	74	74	77	73	71	92	70
	slightly	13	16	11	14	17	7	16
	moderately	8	10	9	10	9	1	11
	severely	4	0	3	3	1	0	2
Depressed	not at all	77	73	78	75	78	87	74
	slightly	8	16	9	15	11	9	13
	moderately	5	10	10	6	8	4	9
	severely	8	1	3	4	2	0	4
Anxious	not at all	71	70	77	69	67	87	66
	slightly	17	20	14	19	22	13	21
	moderately	8	9	6	9	9	0	11
	severely	4	1	3	3	2	0	3
Social contact decreased	not at all	57	62	61	60	57	72	54
	slightly	16	19	17	15	20	4	21
	moderately	13	14	15	12	14	17	13
	severely	15	5	8	11	9	6	11

Decreased social contacts were present in 40% of the various sub-groups. Again, though, the only visible difference was noted between males and females: males were considered as having more social contact. The majority of patients with reduced social contacts were rated as having slight or moderate difficulties in this area.

Somatic Disturbances. Table 25 presents the proportion of patients having difficulties with vision, hearing, and the cardiovascular system. In addition, information is given regarding the samples' global bodily health status. Data are displayed separately for the non-tested and tested, the three age groups, and males and females.

Approximately 40% of the non-tested and tested samples were rated as having no visual difficulties. Of the 60% experiencing these deficiencies, the breakdown regarding the degree of severity was quite similar for both groups. The vast majority received ratings indicative of having slight to moderate problems with their vision. Regarding the sense modality hearing, close to 50% of the samples were not experiencing auditory problems. The distribution of those who were, were quite alike for both the non-tested and tested groups. Concerning cardiovascular disturbances, around 20% of the two samples were not disturbed. Roughly 75-80% of both groups received ratings of either slight or moderate. The tested sample, however, had more patients experiencing moderate cardiovascular problems. The final area, global appraisal of health, indicated that the non-tested sample had a large proportion receiving a health status rating of "poor". The rating "good" was fairly identical for both groups.

Age-related differences in eyesight were not apparent. The degree of severity among the three age groups did not vary by more than 5%. Regarding hearing, with increasing age there appears to be an increment in observed hearing difficulties. These difficulties were most often accounted for in the area of slight and moderate. In both instances the 80-90 year olds were rated as having more auditory difficulties. Age-related differences in cardiovascular functions were somewhat apparent. The young old had a slightly larger percentage of patients classified as not having any problems in comparison with the other two age groups. They were also rated slightly higher in the response category "moderate". Age-related differences were also found in the global bodily health status. With increasing age, fewer patients received a rating of good; rather, their health status was consiedered to be fair.

Table 25

Somatic Disturbances – Profiles of the Sample								
Groups		Non-tested	Tested	61–70 years	71–80 years	81–90 years	Males	Females
N		197	220	77	160	180	83	334
Difficulties with		%	%	%	%	%	%	%
Vision	None	42	43	42	41	42	50	39
	Slight	24	25	29	26	24	19	27
	Moderate	23	29	27	25	28	26	27
	Severe	11	3	3	8	6	6	7
Hearing	None	47	52	67	53	39	57	46
	Slight	28	25	19	24	34	23	28
	Moderate	18	18	11	17	21	16	20
	Severe	7	5	3	6	6	4	7
Cardio-vascular System	None	22	17	22	17	18	36	14
	Slight	45	42	37	43	44	17	49
	Moderate	30	38	39	36	33	43	34
	Severe	3	3	2	4	4	4	3
Global bodily health status	Good	14	15	26	14	11	36	11
	Fair	53	66	48	58	66	55	60
	Poor	33	19	26	28	24	9	29

Table 26

Medical Diagnosis – Profiles of the Sample					
Groups	Non tested	Tested	61–70 years	71–80 years	81–90 years
N	197	220	77	180	180
	%	%	%	%	%
Number of diagnosis					
None	6	12	15	5	7
One	10	11	8	8	10
Two	27	28	33	21	26
Three or more	57	48	44	66	57

Sex-related differences were more distinguishable on the bodily functions assessed. In every parameter, a larger proportion of males were rated as not having difficulties with the particular function in question. Regarding the individual breakdown in the degree of severity, females, on the average, received ratings indicative of having more difficulties with vision, hearing, cardiovascular functions, and a substantially higher proportion of this group received a global health status rating of "poor".

Medical diagnoses. Patients were diagnosed by their ward doctor in accordance with the International Classification of Diseases, 8th revision (ICD 8, 1967). Diagnoses were made for three categories: mental disorders, neurological disorders, and general somatic disorders.

Approximately 33% of the sample were diagnosed as having some type of mental disorder. Out of this sample, N = 157 (66%) received the diagnosis of senile dementia, with the ratio of women to men being 3 to 1. The remaining 50 patients were evenly grouped under the following diagnoses: alcoholic psychosis, psychosis associated with other cerebral conditions, schizophrenia, alcoholism, and neurosis.

Less than 9% of the sample had neurological disorders such as parkinsonism. Over 80% of the patients had a dual diagnosis indicative of general somatic disorders. Of the patients who received a diagnosis reflecting somatic disorders, 72% had diseases of the circulatory system, e.g., arteriosclerosis and cerebrovascular dis-

eases were predominant. The remaining patients had various other somatic disorders such as those of the endocrine system, genito-urinary system, and muscular skeletal system.

Table 26 presents information regarding the number of diagnoses the patients received according to the non-tested and tested groups, and likewise for the three age groups. The main difference between the non-tested and tested group was that the former group had slightly more patients receiving three or more diagnoses. Regarding the factor age, there appears to be a slight age-related increase in the number of diagnoses given with increasing age. The 71-80 year olds had the largest percentage of patients who were given three or more diagnoses.

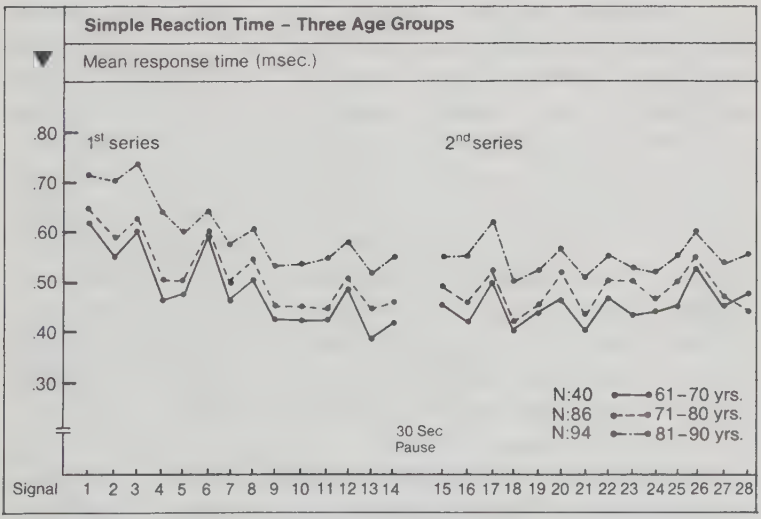
Psychomotor Performance - Reaction Time Measurements

These data are presented in Figures 1 through 4 and in Tables 28 and 29. The graphs displayed in the figures represent the patients' mean response time to the 28 signals occurring in the two SRT series and to the 16 signals occurring in the two DRT series, drawn separately for the three age groups and for males and females. The ordinate axis indicates the range of reponse time in msec. and the abscissa axis shows the individual signals. The means and standard deviations of the first 14 signals, SRT - 1st series; of the second 14 signals, SRT - 2nd series; of the first 8 signals, DRT - 1st series; and of the second 8 signals, DRT - 2nd series, are listed in Table 28, categorized for age and sex. The results of the ANOVA (F-ratios) are given in Table 29 for the factors age, sex, and age x sex interaction. Statistically significant findings, $P < 0.05$ and $P < 0.01$, are indicated.

Simple Reaction Time

Age-related responses and differences which occurred during the 28 SRT signals are displayed in Figure 1. Characteristic of the three age groups was the gradual decrease in mean RT throughout the first series, and more so during the first nine signals. In addition, the range of RT for each group was approximately 20 msec. Another feature was the similarity among the groups in terms of response patterns from one signal to the next; the increases and decreases between signals appeared to be uniform. Even more striking was the likeness of the response pattern between the younger age group and the middle age group. The main difference was that the oldest age group was consistently slower throughout this series; however, the percentage of decrease from signal 1 to 14 was comparable with that found on the other two age groups.

Figure 1

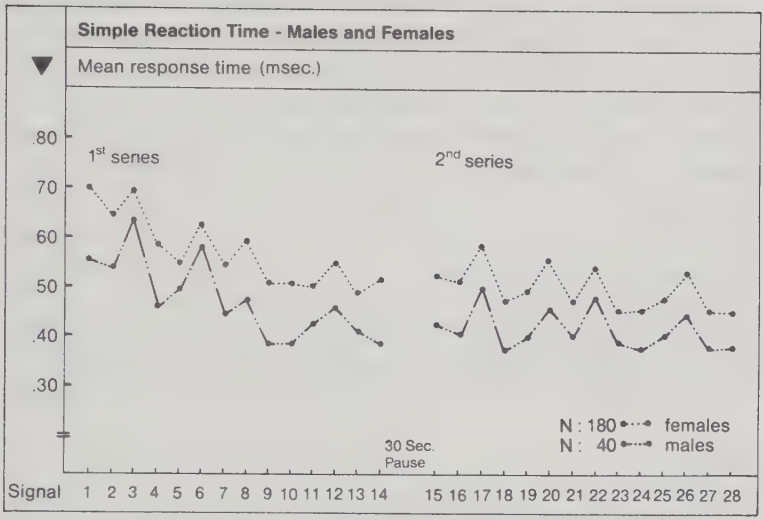

Simple Reaction Time – Three Age Groups
Mean response time (msec.)
.80
.70
.60
.50
.40
.30
1st series
2nd series
N:40 61-70 yrs.
N:86 71-80 yrs.
N:94 81-90 yrs.
30 Sec Pause
Signal 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28

Similar aspects were present during the second series of signals. The regularity of the response pattern was apparent among the three age groups as was the sameness between the younger and middle age groups. Also the range was comparable among the three; it decreased from 20 msec in the first series to approximately 14 msec. in the second. The difference, as before, was that the 81-90 year olds had the slowest mean RT's. Finally, the gradual shortened response time observed over the first series was not so noticeable during this series of signals.

Mean and standard deviations of the 14 signals recorded on the two SRT series for the various age groups are presented in Table 28. Clear differences were registered among the three age groups. The 61-70 year olds had the shortest mean RT for both series and the 81-90 year olds had the longest mean RT for both series. The 61-70 year olds responded on both series approximately 10% faster than the 71-80 year olds, and 25% faster than the 81-90 year olds. Standard deviations also reflected the same differences; the youngest age group had the lowest and the oldest age group the highest differences. However, the mean difference between the first series and the second series was more or less the same for all three groups, i.e., there was a 13% decrease from the first series to the second, but no change among the respective standard deviations. The results of the ANOVA, Table 29, yielded significant age-related differences on both series of signals. Differences were significant among the three age groups at the 1 percent niveau.

Sex-related responses and differences which occurred throughout the 28 SRT signals are shown in Figure 2. As with the age-related findings, similar sex-related

Figure 2


Simple Reaction Time - Males and Females
Mean response time (msec.)
.80
70
60
50
.40
.30
1st series
2nd series
30 Sec.
Pause
N : 180 females
N : 40 males
Signal 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28

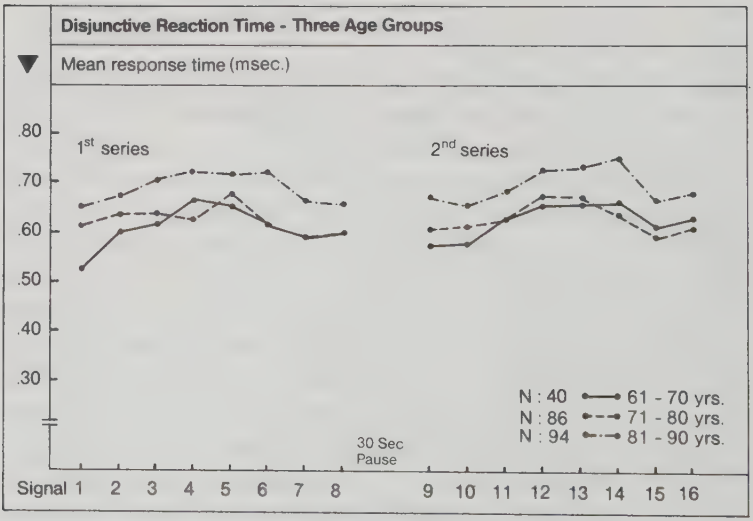
features were apparent. That is to say there was a gradual decrease in RT responses during the first series of signals, the range was approximately 20 msec., and there was similarity of males and females regarding the response pattern from one signal to the next. Males, though, on occasions had either larger increases or decreases from one signal to the next: e.g., 2 to 3, 3 to 4, 6 to 7. The main difference was that females responded consistently slower to every signal even though the percentage of decrease from the beginning to the end was roughly the same for males and females. Characteristic of the second series was the sameness of the response pattern for both sexes, the decreased range and the consistent mean difference on almost all of the signals between males and females. The respective means and standard deviations are given in Table 28.

Males responded, in terms of mean RT, 19% faster on both series than the females, and their standard deviations were slightly lower. The mean changes from series one to series two, however, were congruent: a 13% decrease. Significant sex-related differences were obtained on the ANOVA, Table 29. Males had significant shorter RT's on both series and both were significant at the 1 percent niveau. No age and sex interactions occurred on either SRT series.

Disjunctive Reaction Time

Age-related responses and differences occurring throughout the 16 DRT signals are shown in Figure 3. The mean response times of the youngest and oldest age groups

Figure 3


Disjunctive Reaction Time - Three Age Groups
Mean response time (msec.)
.80
.70
.60
.50
.40
.30
1st series
2nd series
N : 40 61 - 70 yrs.
N : 86 71 - 80 yrs.
N : 94 81 - 90 yrs.
30 Sec Pause
Signal 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

increased slightly in the first half of the series and gradually tapered off towards the end; the middle age group remained more or less constant during this series. The range with the exception of signal one (for the 61-70 year olds) was 8 msec. More similarity in terms of mean RT was registered between the 61-70 year olds and the 71-80 year olds and the 81-90 year olds were consistently slower on each DRT signal. Following the 30-second pause, similar findings were present during the second series, i.e., slight mean increases in the beginning and gradual tapering off at the end, a range approaching 8 msec., similarity between the young and middle age group, and slower mean RT on all 8 signals for the oldest age group in comparison with the other two age groups.

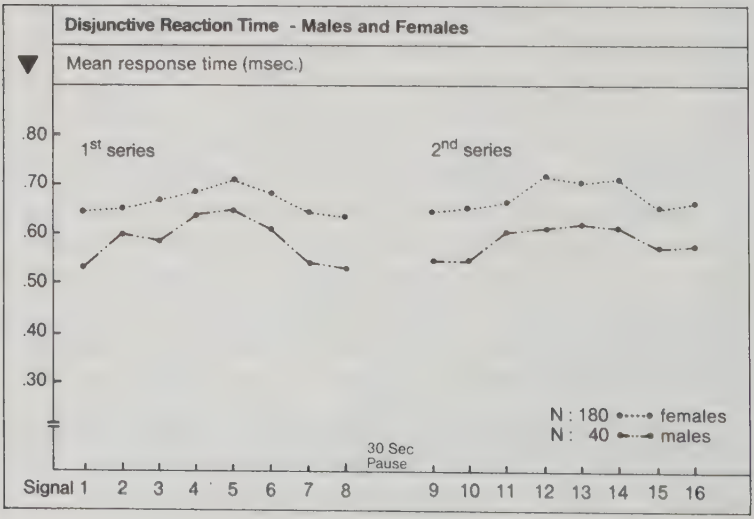
Means and standard deviations of the 8 DRT recorded on the two series are listed in Table 28. Mean differences were more pronounced between the 81-90 year olds and the other two age groups, whereas hardly any difference emerged among the standard deviations. The 61-70 year olds responded approximately 3% faster than the 71-80 year olds and 14% faster than the 81-90 year olds. These findings applied to both series. The mean increase of the three age groups from series one to two was less than 2%. The results of the ANOVA, Table 29, yielded significant age-related differences. The differences reached the 5% niveau on the first series and the 1 percent level on the second series. In both instances the length of the DRT response was prolonged with increasing age, and this prolongation was more pronounced on the 81-90 year olds.

Sex-related responses and differences on the DRT signals are presented in Figure 4. The males' and females' mean response times increased gradually through the first

four signals, peaked at signal five and then descended slowly. The range of responses was around 14 msec. and 8 msec. for males and females, respectively. Males registered shorter mean RT's on each signal with the difference being more noticeable at the beginning and ending. A similar picture emerged during the second series. This time, though, the response patterns resembled one another more; and the mean differences between signals was more constant and marked, with males, as before, reacting quicker to each signal. The range approached 8 msec. for both sexes.

Means and standard deviations are given in Table 28. Males responded on the average 14% faster than females on both series, and standard deviations were practically the same. Males showed no change in mean response from series one to series two, and females had an increase of one msec. The findings of ANOVA, Table 29, resulted

Figure 4



in significant sex-related differences, and in both series they favored the males. These differences reached the 5 and 1 percent niveau, respectively.

No interaction occurred between the factors age and sex on DRT.

Comparison of simple and disjunctive RT. Table 27 presents the mean values of SRT and DRT for three samples: young volunteers, elderly volunteers (two age groups), and the IWH sample (three age groups). Mean differences (DRT - SRT), mean ratio scores (DRT/SRT), and the percentage changes are also shown for the respective groups.

The mean values indicate that with increasing age there was a prolongation of both SRT and DRT, these being more pronounced on DRT. This lengthening was even more substantial for the hospitalized geriatric sample in comparison with the young adults; the percentage changes

Table 27

Comparison of Simple and Disjunctive Reaction Time

Groups	Young volunteers	Elderly volunteers		IWH sample			Percentage changes						
	A	B	C	D	E	F	A-B	A-C	A-D	A-E	A-F	B-F	C-E
Ages	21–35	60–69	70–80	61–70	71–80	81–90							
SRT*	0.255	0.315	0.345	0.450	0.495	0.565	24	35	76	94	122	43	43
DRT*	0.305	0.415	0.450	0.615	0.635	0.705	36	48	101	108	130	48	41
DRT-SRT	0.050	0.100	0.105	0 165	0.140	0.140							
DRT/SRT	1.19	1.32	0.30	1.37	1.28	1.25							

* average RT of 1st and 2nd series

of the geriatric samples were disproportionately higher than the elderly volunteers. Likewise were the mean differences between the two types of RT measurements substantially higher for the institutionalized sample than for the elderly and young adults. The ratio measures indicate that with advancing age there was also an augmentation of this parameter, but that the factor hospitalization did not cause additional augmentation. If anything, and more so for the IWH sample, there was a decrease on the ratio scores with advancing age.

Statistical tests computed for the IWH sample revealed that there was no significant difference among the three age groups for the variables 'mean differences' and 'mean ratio scores'.

Continuous Performance Tests - Numerical Matching and Addition.

These data are presented in Figures 5 through 8, and in Tables 28 and 29. The graphs displayed in the figures reflect either the mean number of problems completed for six consecutive 30-second periods or the cumulative mean of these six consecutive 30-second periods. As with motor performance data, values are shown for age groups and sexes. Standard values of the six time segments averaged together are found in Table 28 categorized for age and sex. The results of the ANOVA, F-Ratios, are given in Table 29 for age, sex, and age x sex interaction.

Numerical Matching - Age-related findings and differences obtained on NM are shown in Figure 5. The graphs illustrate the rate of performance over the three min-

Table 28

Standard Values of the Performance Tests - Profiles of the Sample						
Groups		61 – 70 yrs.	71 – 80 yrs.	81 – 90 yrs.	Males	Females
Tests						
SPMSQ	$\bar{X}$	7.1	6.8	5.6	6.9	6.2
	S	2.36	2.46	2.47	2.35	2.58
SRT - 1st series	$\bar{X}$	0.48	0.53	0.60	0.48	0.57
	S	0.12	0.15	0.17	0.13	0.17
2nd series	$\bar{X}$	0.42	0.46	0.53	0.42	0.50
	S	0.12	0.14	0.18	0.11	0.16
DRT – 1st series	$\bar{X}$	0.61	0.63	0.70	0.59	0.67
	S	0.17	0.16	0.15	0.15	0.16
2nd series	$\bar{X}$	0.62	0.64	0.71	0.59	0.68
	S	0.16	0.15	0.15	0.14	0.15
NM	$\bar{X}$	13.7	12.4	10.6	13.8	11.5
	S	5.64	5.48	4.77	4.77	4.90
ADD	$\bar{X}$	10.9	10.1	8.5	10.8	9.2
	S	5.04	5.28	4.38	4.48	4.64

Abbreviations

SPMSQ = Mental status Questionnaire
SRT = Simple reaction time
DRT = Disjunctive reaction time
NM = Numerical Matching
ADD = Addition

Table 29

Performance Tests – Age x Sex ANOVA – F Ratios							
Tests ▲	SPMSQ	SRT - 1	SRT - 2	DRT - 1	DRT - 2	NM	ADD
Effects							
Age (A)	6.86*	7.50*	5.59*	3.59+	5.37*	5.21*	4.03+
Sex (S)	2.04	8.81*	7.65*	4.77+	7.62*	3.31	1.35
A x S	0.53	0.83	0.33	0.18	0.10	1.45	1.30

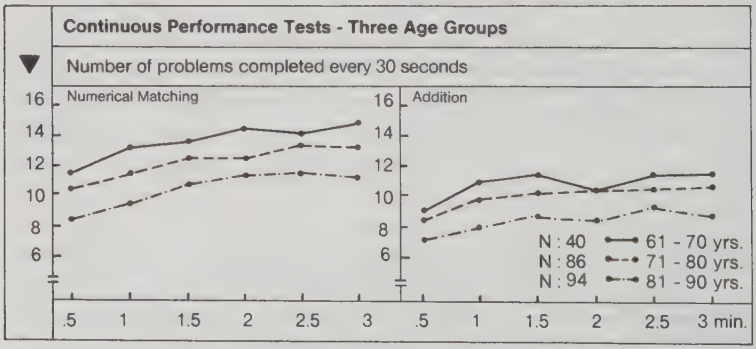
+ = $p < 0.05$
* = $p < 0.01$

▲ Abbreviations

SPMSQ = Mental status Questionnaire
SRT = Simple reaction time
DRT = Disjunctive reaction time
NM = Numerical Matching
ADD = Addition

ute testing period. Characterictic of each group was the gradual increase in the number of matching problems completed through the six time segments. The curves demonstrated positive transfer from one time segment to the next and they only begin to plateau off at the end of the three minute testing period. The younger age group completed 11.7 problems during the first 30 seconds and 14.9 problems during the last 30 seconds, a 27% increase. The 71-80 year olds averaged 10.3 problems in the first 30 seconds and raised their output to 13. during the last time segment, a 31% increase. The 81-90 year olds completed, on average, 8.5 problems during the first time segment and increased to 11.7 problems by the last period, a 38% growth rate. Each age group increased its mean output from the first 30 seconds to the last 30 seconds by 3.2 problems; but since the 81-90 year olds averaged less per time segment, their percentage of improvement was more pronounced.

Figure 5

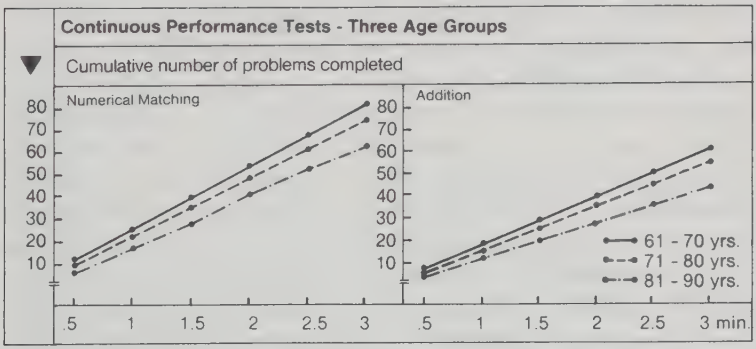


Nevertheless, clear age-related differences were apparent. The 61-70 year olds performed at a higher rate at each time period. This pattern was also reflected in their cumulative performance profiles, Figure 6. In a span of three minutes the 61-70 year olds completed 82 problems, whereas the 71-80 year olds finished 74 problems, and the 81-90 year olds 63 problems. The cumulative differences were 10% and 29%, respectively. Breaking it down further, the 61-70 year olds completed one problem every 2.2 seconds; the 71-80 year olds one problem every 2.4 seconds, and the 81-90 year olds one problem every 2.8 seconds.

Addition

Similar findings and trends were found among the results of the addition performance tests. It is important to remember that this task was more difficult and that more was required of the respondents. In comparison with NM, the age-related performance rates were approximately 25%

Figure 6



lower on ADD for all three age groups (Fig. 5 right-hand side). Each age group solved more adding problems from one time segment to the next. The 61-70 year olds averaged 9 problems during the first 30 seconds and 11.6 during the last 30 seconds, a 29% increase. The 71-80 year olds completed 8.2 problems during the first 30 seconds and their output at the last 30 seconds was 10.8, a 32% increase. The 81-90 year olds completed on the average 7.2 problems during the first 30 seconds and increased their average output to 8.9 problems, a 24% increase. The percentage of improvement on ADD was similar to the NM findings for 61-70 and 71-80 year olds, but was somewhat lower for the 81-90 year olds.

As with NM, the 61-70 year olds completed more problems per time segment. However, the mean difference between them and the 71-80 year olds was not so pronounced. At the two minute interval, their mean averages were practically the same. The cumulative performance profiles (Fig. 6) also demonstrate the decreased output on ADD in comparison with NM. The 61-70 year olds solved 65 problems in three minutes, the 71-80 year olds completed 60 problems, and the 81-90 year olds solved 51 problems. The cumulative differences were 8% and 28% between the younger and middle-age, and the younger and old age groups, respectively. The 61-70 year olds averaged one problem every 2.8 seconds, the 71-80 year olds needed 3 seconds and the 81-90 year olds 3.5 seconds per problem. Interesting is that all three age groups needed approximately the same additional amount of time in performing basic arithmetic operations in contrast to performing numerical matching problems.

Means and standard deviations of the six time segments combined for the continuous performance tests are given in Table 28. The data is shown separately for each age

group. Clear age differences were found on both tests. The 61-70 year olds had the highest and the 81-90 year olds the lowest mean performance rate on both tests. Comparing the discrepancy between the 61-70 and the 71-80 year olds, and between the 71-80 and the 81-90 year olds, a much more marked difference was found between the two older age groups. Results of the ANOVA (Table 29) supported these findings and yielded significant age differences. F-ratios on NM were significant at the 1 percent niveau and at the 5 percent niveau on the ADD.

Sex-related findings and differences of NM appear in Figures 7 and 8. Males showed the sharpest increase between 30 and 60 seconds, then gradually tapered off. They completed 11.2 problems during the first 30 seconds and increased their output to 15 problems during the last 30 seconds to a 34% increase in productivity. Females, on the other hand, augmented their performance continuously throughout the test period, averaging at the beginning 9.5 problems and finishing at 12.5 problems, for a 32% increment. Males, thus, clearly completed more problems per segment, and this was also reflected in the cumulative performance. After three minutes of continuous work, males finished 83 problems, while females, completed 69 problems, the percent difference in performance being 20%.

Comparable sex-related findings and differences were found on the test ADD. Males solved approximately 18% more problems per time segment than the females. Both performance patterns plateau after the third segment and remained fairly constant thereafter. Males increased their average output from the first 30 seconds to the last by 32%, while females increased theirs by 27%.

The respective standard values are found in Table 28. Males performed better on both tests with the discrepency being more pronounced on NM. Standard deviations were slightly lower for the males. Results of the ANOVA, however, yielded no significant sex-related differences. Statistically, males and females were not differentiated on simple and basic arithmetic operations (Table 29).

Figure 7

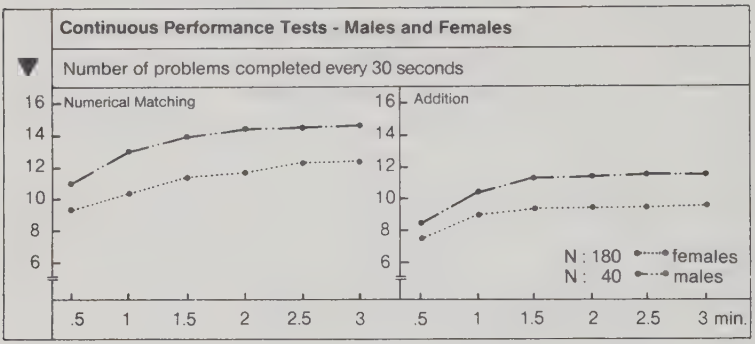
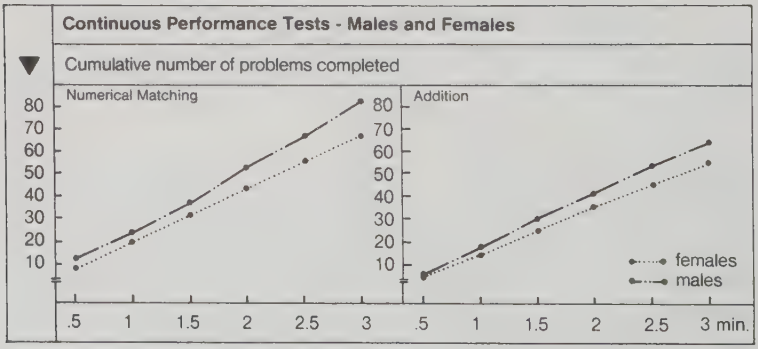


Figure 8



SPMSQ

Table 28 presents the mean values and standard deviations of the tested sample that completed the SPMSQ at MP 1. The data are shown for the sample subdivided into three groups and for males and females. Mean values represent the number of correct responses obtained out of a possible 10.

Table 29 illustrates the results of the ANOVA. Listed in this table are the F-ratios derived for the factors age and sex, and their interaction.

Age-related differences were found among the three age groups. The younger and middle-aged group answered correctly approximately 7 out of the 10 items, whereas the mean repsonse rate of the older age group was somewhat lower.

The results of the ANOVA demonstrated statistically this age disparity. The difference was significant at the 1 percent niveau. It is evident that this finding is the result of the lower score obtained by the 81-90 year olds in comparison with the similar scores of the other two age groups.

Sex-related differences are slight. Males obtained a fractionally higher score than the females, but their respective means were not statistically significant from one another. No interaction effects were derived.

Correlation analysis. Table 30 presents the correlation coefficients obtained on the variables tested at MP 1. The indices used for this analysis were the composite scores of the behavioral rating scales, the average RT of two series, the average performance score of the six time segments, and the number of correct responses on the SPMSQ.

Significant correlations were found between the two behavioral rating scales, NOSIE and GRS, approximately 24% of the variance on one was explained by the other. Both scales were also correlated with the continuous performance tests, r = 0.34 - 0.38 and accounted for around 13% of the total variance. Doctors' ratings, GRS, correlated significantly with the RT measurements, but explained less than 7% of the variance. Moderate to marked correlations were found among the various performance tests. The most pronounced were between the two RT tests, r = 0.62, and between the two performence tests, r = 0.86. Both continuous performance tests correlated also with the mental status questionnaire, and approximately 16% of the variance on one was explained by the other.

Table 30

Correlation Coefficients of the Tested Sample – MP I

	NOSIE	GRS	SRT	DRT	NM	ADD	SPMSQ
NOSIE							
GRS	− 0.48*						
SRT	− 0.11	0.25*					
DRT	− 0.12	0.25*	0.62*				
NM	0.36*	− 0.38*	− 0.38*	− 0.46*			
ADD	0.34*	− 0.35*	− 0.34*	− 0.45*	0.86*		
SPMSQ	0.28*	− 0.21	− 0.15	− 0.15	0.37*	0.42*	

* = P < 0 01

The findings of the tested sample based upon the patients' attrition are presented in Tables 31 - 33 and in Figures 9 - 11. These results are based on the data obtained at MP I. The tested sample consisted of four groups. Group one completed the tests only at MP I, group two completed the tests through MP II, group three

through MP III, and group four through MP IV. Reasons leading to the reduced sample size are given in Tab. 17, Dropouts, p. 90.

Behavioral Rating Scale

NOSIE. Ratings assigned by the nurses are shown in Table 31. Neither the positive, the negative factors, nor the total assets score differentiated the four groups. Ratings in terms of mean factor scores were practically identical among the four groups. These findings were supported by the ANOVA. None of the factors were significantly different among the four groups.

GRS. Ratings given by the doctors are listed in Table 32. Like their counterparts, doctors ascribed ratings which did not distinguish the four groups from one another except for one factor: sensory impairment. Group one was marked as more impaired for this factor in contrast with the other three groups. This factor was the only one which yielded a significant difference $P < 0.05$, among the four groups.

Performance Tests

Means and standard deviations derived on the psychomotor, continuous performance, and mental status tests for the four groups are found in Table 33 along with graphic illustrations in figures 9 - 11. Like the findings of the behavioral rating scales, no discernible findings were obtained on any of the tests which differentiated the groups from one another. Rather, the test scores among the four groups were quite alike.

Table 31

NOSIE - Profiles of the tested Sample						
Groups		1 MP1	2 MP2	3 MP3	4 MP4	F-Ratio
N		54	48	39	80	
Factors (score range)						
Positive						
Social competence	$\bar{X}$	21.0	20.9	21.2	21.4	0.19
(5 - 25)	S	4.63	4.34	4.12	3.79	
Social interest	$\bar{X}$	16.9	15.8	16.2	17.6	1.61
(5 - 25)	S	4.96	5.31	5.69	4.74	
Personal neatness	$\bar{X}$	15.2	14.8	14.8	14.2	0.56
(4 - 20)	S	5.13	5.48	5.17	4.68	
Negative						
Irritability	$\bar{X}$	10.4	11.1	10.4	9.8	0.47
(6 - 30)	S	4.43	4.84	4.70	4.14	
Manifest Psychosis	$\bar{X}$	5.1	5.3	4.6	4.9	0.84
(4 - 20)	S	2.40	2.70	1.55	2.36	
Retardation	$\bar{X}$	8.1	8.6	7.7	8.2	0.47
(3 - 15)	S	3.51	3.51	3.79	3.26	
Depression	$\bar{X}$	4.2	4.9	4.6	4.7	1.40
(3 - 15)	S	1.88	2.15	2.12	1.92	
Total assets	$\bar{X}$	175.2	171.6	174.9	175.7	0.54
(84 - 204)	S	19.86	20.29	19.75	17.4	

Table 32

GRS - Profiles of the tested Sample						
Groups		1 MP1	2 MP2	3 MP3	4 MP4	F-Ratio
N		54	48	39	80	
Factors						
Social dysfunction	$\bar{X}$	0.74	0.75	0.79	0.67	0.66
	S	.48	.54	.45	.45	
Aggressiveness	$\bar{X}$	0.06	0.05	0.07	0.06	0.17
	S	13	.13	.13	.14	
Incapacitation	$\bar{X}$	0.50	0.42	0.46	0.40	0.94
	S	.44	43	.37	.34	
Sleep disturbance	$\bar{X}$	0.12	0.13	0.18	0.11	0.61
	S	.27	.30	.35	.29	
Sensory impairment	$\bar{X}$	0.48	0.32	0.32	0.26	3.19+
	S	.51	.46	.39	.43	
Work perfomance	$\bar{X}$	1.79	1.74	1.82	1.70	0.74
	S	.38	.53	.44	.51	
Total score	$\bar{X}$	15.78	14.8	16.1	13.35	1.57
	S	8.19	8.89	6.92	7.07	

+ = $p<0.05$

Regarding motor performance, similar response times were recorded on both tests for both series. Mean ranges among the four groups were within 6 msec. on SRT and 5 msec. on DRT. The mean decrease on SRT was fairly consistent from the first to the second series for the four groups, and a slight increase was noted for the three groups on DRT. These similarities are graphically highlighted in Figures 9 and 10. As can be seen, the response patterns and mean RT per signal were similar among the four groups throughout the 28 SRT and 16 DRT signals.

This resemblance in motor performance was also found on the continuous performance tests (Fig. 11). The mean number of problems completed, averaged for six time segments,never differed by more than eight-tenths of a point on either NM or ADD. If anything, group four performed slightly better on both tests. This data is also given for the individual time segments. Each group gradually increased its performance through the three minute testing period.

The similarities in motor and problem-solving performance were supported by the ANOVA. None of the test results yielded significant differences.

In addition, the results of groups one, two, and three were averaged together and contrasted with those of groups four. T-tests were computed on the 22 variables referenced above. Out of the 22 variables significant differences were found on only two, both of which were factors from the GRS. Doctors rated group four as having less sensory impairment (t value 2.15, $p < 0.05$) and assigned them a lower overall rating: mean score of 13.4 vs. 15.5 (t value 2.12 $p < 0.05$). None of the other comparisons achieved a significance of $p < 0.05$. Five of these comparisons yielded probabilities of under 0.20 and the majority of the rest were over 0.50.

Table 33

Standard Values of the Performance Tests

Groups N =		1 MP1	2 MP2	3 MP3	4 MP4	F-Ratio
Tests ▲						
SPMSQ	$\bar{X}$	6.3	6.8	7.3	6.4	1.62
	S	2.53	2.57	2.43	2.40	
SRT - 1st series	$\bar{X}$	0.52	0.56	0.54	0.50	1.37
	S	0.14	0.15	0 15	0.13	
2nd series	$\bar{X}$	0.47	0 47	0.46	0.45	0.28
	S	0.14	0.13	0.14	0.15	
DRT - 1st series	$\bar{X}$	0.62	0.65	0.62	0.63	0.33
	S	0.14	0.16	0.12	0.17	
2nd series	$\bar{X}$	0.62	0.67	0.63	0.65	1.22
	S	0.14	0.15	0.14	0 16	
NM	$\bar{X}$	12.1	12.2	12.9	12.9	0.50
NM	S	5.42	4.26	3.59	4.76	
ADD	$\bar{X}$	9.6	9.9	10.0	10.3	0.34
	S	4.97	4.10	4.06	4.61	

▲ Abbreviations

SPMSQ = Mental status Questionnaire
SRT = Simple reaction time
DRT = Disjunctive reaction time
NM = Numerical Matching
ADD = Addition

Figure 9

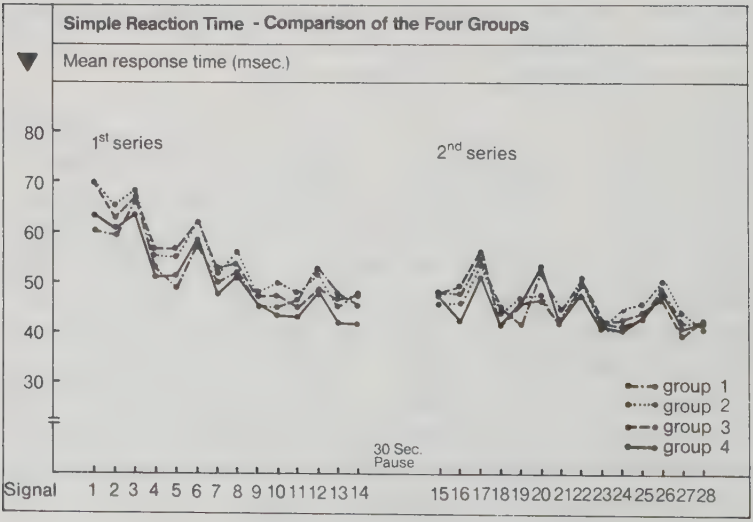


Figure 10

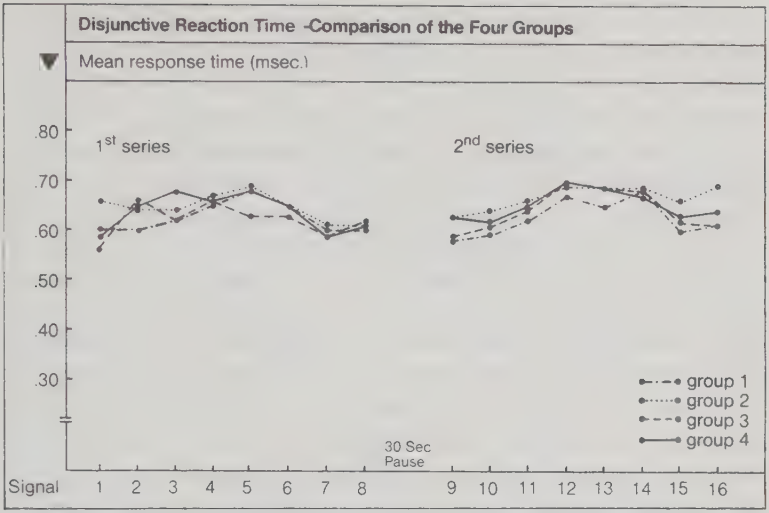
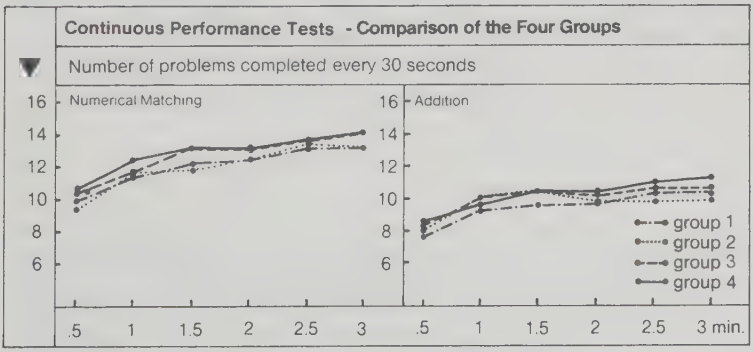


Figure 11



Longitudinal findings

This section of the report describes and highlights the longitudinal findings obtained on group four. This group was comprised of 80 patients. They were tested and re-tested on a variety of psychometric tests covering a period of two years. All 80 patients completed the tests through MP 4, a year after the study began. One year later, MP 5, approximately 80% of the patients were re-tested on the RT tests, administered the SPMSQ, and re-assessed by their respective ward doctors and nurses.

The mean values and standard deviations of the various test results are presented for the three age groups for the applicable MP. Findings are shown both in tabular form and in graphic illustrations. Blanks appearing in certain tables indicate that the corresponding test was not assessed at this particular MP. The format used in the tables and figures is fairly identical. Tests and their scoring ranges are always plotted on the left ordinate. Next to this are the various age groups, and the respective cell sizes are given in parentheses. Across the top of the different tables is the information regarding the MP and their corresponding dates. Results are presented in the following sequence:

1. Behavioral Rating Scales
2. Self-rating Scales
3. Performance Tests.

The results of the ANOVA, F-ratios, for the three parameters are found in the appropriate sections.

Behavioral Rating Scales

The longitudinal findings of these scales, NOSIE, GRS and CGI, are presented in Table 34. Descriptive statistics are reported only on the composite scores. No additional information was brought forth by displaying the means and standard deviations of the individual factors, as was done in the cross-sectional result section. The factor scores assigned by the ward doctors and nurses for the three age groups approximated one another. Their profiles revealed no substantial change over time. Therefore, the composite scores will be employed as the index of evaluation and comparison among the three age groups.

NOSIE

Differences in ward behavior in terms of total asset scores were noted among the three age groups. An inspection of the means reveals that the nurses assigned the 61-70 year olds lower ratings (indicative of more impairment) throughout the two-year study in comparison with the two older groups. This disparity was greater in the earlier part of the study and decreased somewhat over the duration of the study. The two older age groups, on the other hand, were given quite similar ratings during the course of the study. Their mean difference never exceeded four points.

Time effects were also apparent in the nurses' ratings from one MP to the next. During the first year ratings for all groups were characterized by gradual increments, whereas the change following the last year interval for all age groups was marked by a decrease in the composite score; this was more pronounced for the 71-80 year old group. Thus, the direction and quantity of the changes recorded by the ward nurses for the three age groups was fairly uniform over the two year observation period. In

addition a breakdown of the behavioral variability indicated that 10% of the sample manifested behavioral improvement, 30% gave evidence of stability, 13% showed deterioration, and 47% had cyclical variability in behavioral functioning.

The variance (standard deviation) was largest for the 71-80 year olds and the smallest was found amongst the 81-90 year olds. The variance was more pronounced at MP 2. Fluctuations were more natable during the later phase of the study, specifically from MP 3 to 4 and MP 4 to 5.

The ANOVA reflected these age and time effects. Significant age differences, $p < 0.05$, were obtained. Pair comparisons of the means indicated that the young olds received significantly lower ratings than the other two groups, but that they did not differ from one another. Regarding the factor time, the ANOVA yielded no significant differences. However, pair comparisons of behavioral changes occurring from one MP to the next demonstrated that the ratings decreased significantly from MP 4 to MP 5. No age x time interactions were observed (Table 35).

GRS

Similar trends were visible regarding the behavioral observations of institutional functioning made by the ward doctors. Like their counterparts, the doctors rated the social and physical functioning level of the 61-70 year olds slightly higher (indicative of more impairment) than the other two age groups. It is noted though that the difference separating the age groups was minimal. At MP 2, the largest mean difference was observed, 2.6 points, and at the close of the study this mean difference had shrunk to nine-tenths of a point. In addition, the doctors hardly distinguished between the 71-80 and 81-90 year olds regarding their overall functioning.

Time effects were also evident in the ratings from one MP to the next. Characteristic was that the direction of change (increasing or decreasing) was identical from MP 1 to 2, MP 2 to 4, and MP 4 to 5 for the three age groups, and that the numerical changes among the three were comparable. The numerical change correlated with the length of time between the MP's; thus the largest alteration occurred between MP 4 and MP 5. In addition, the breakdown of behavioral variability over the two years of observation revealed that 9% showed improved, 39% maintained their plateau, 15% deteriorated, and 37% recorded fluctuations in behavioral functioning.

Standard deviations were larger among the 71-80 year olds. In addition, the variances were more inflated at the beginning and end of the study.

No significant differences, based upon the ANOVA, were found due to age or time (Table 35). Likewise no interaction effects were noted. Pair comparisons brought forth no additional information.

CGI

The findings of this rating scale made by the ward doctors lend support to those just reported. This scale was employed at two MP: 3 and 4. As with the other behavioral rating scales, distinctions were made between the 61-70 year olds and the other two age groups. At both MP they obtained slightly higher ratings, while the 71-80 and 81-90 year olds were practically identical in the doctors' global impression. Regarding time effects, no substantial changes were found for any of the age groups.

The ANOVA yielded a significant age effect. Pair comparisons showed that the 61-70 year olds were rated higher than the other two. No significant changes were attributed to time.

Table 34

Behavioral Rating Scales – Longitudinal Findings of the Three Age Groups

MP Date			1 May '77	2 Nov. '77	3 Dec. '77	4 June '78	5 June '79
Tests (Range)	Age groups (N)						
NOSIE (84-204)	61-70 (18)	$\bar{X}$	169.7		172.5	174.7	170.4 (15)
		S	18.6		18.4	14.9	15.8
	71-80 (28)	$\bar{X}$	178.2		178.8	181.2	172.4 (21)
		S	18.9		20.7	13.6	15.7
	81-90 (34)	$\bar{X}$	177.0		180.0	179.3	176.1 (27)
		S	15.4		14.5	10.3	13.2
GRS (0-62)	61-70 (18)	$\bar{X}$	15.3	15.7		13.2	14.8 (15)
		S	6.59	6.14		6.25	6.71
	71-80 (28)	$\bar{X}$	12.9	13.6		12.0	13.9 (21)
		S	7.02	6.20		6.69	7.34
	81-90 (34)	$\bar{X}$	12.9	13.1		11.7	14.4 (27)
		S	7.34	5 59		6.42	6.47
CGI (0-7)	61-70 (17)	$\bar{X}$			3.8	3.9	
		S			1.31	1.21	
	71-80 (28)	$\bar{X}$			3.0	3.2	
		S			1.08	1.38	
	81-90 (27)	$\bar{X}$			3.2	3.1	
		S			1.16	1.11	

Table 35

Rating Scales – Age x Time ANOVA – F Ratios

Scales	NOSIE	GRS	SAI	BFS	LSI	CGI
Effects						
Age (A)	4.29^{+}	1 82	1.53	0.76	1.03	3.41
Time (T)	1.57	1.44	0.78	1.68	—	0.31
A x T	0.25	0.13	0.26	1.50	—	

$^{+} = p < 0.05$

Self-Rating Scales

The longitudinal findings of the self-rating scales SAI, BFS and LSI are described here. The standard values, means and standard deviations are presented in Table 36. The SAI and BFS were given out on two occasions, MP 3 and 4; and the LSI was administered only once. In order to appreciate the scores obtained by this sample it is helpful to review the reference values presented in the methodology section concerning the scale in question.

State Anxiety Inventory

The levels of state anxiety did not vary substantially as a function of age. Mean differences among the three age groups were always within five points of one another. The 71-80 year olds reported having the lowest level of state anxiety at both MP. Slight increments in theirs and the 61-70 year olds' level were registered after the six months interval. The responses of the 81-90 year olds showed no variation from MP 3 to 4. Standard deviations were constant for the 71-80 and 81-90 year olds, and decreased slightly for the 61-70 year olds.

The results of the ANOVA supported these findings; no significant differences in the levels of state anxiety were found due to the effects of age or time. Also, no interaction effects occurred (Table 35).

Mood Depression Scale

The levels of mood depression differed among the three age groups. The 81-90 year olds endorsed more adjectives (indicative of feeling more unpleasant) in comparison with the other two age groups. The 61-70 year olds responded more favorably regarding their present state

of well-being. Six months later, however, the 61-70 year olds endorsed considerably more adjectives descriptive of unpleasant states. No meaningful alterations occurred among the other two age groups. The increase within the young old group made the means among the three groups more similar. The most marked change in standard deviation was found on the 61-70 year olds' scores.

No significant differences in the ANOVA were found due to age or time. The shift in the mean response of the 61-70 year olds, however, strongly suggested a time effect, $p < 0.10$. In addition, even though the age x time interaction was not significant, there was a tendency present (Table 35).

Table 36

Self-Rating Scales – Longitudinal Findings of the Three Age Groups

MP Date			1 May '77	2 Nov. '77	3 Dec. '77	4 June '78	5 May '79
Tests (Range)	Age groups (N)						
SAI (20-80)	61-70 yrs. (18)	$\bar{X}$			44.9	48.2	
		S			14.77	12.98	
	71-80 yrs. (28)	$\bar{X}$			41.7	44.3	
		S			12.03	12.76	
	81-90 yrs. (34)	$\bar{X}$			46.6	46.7	
		S			10.94	11.00	
BFS (0-56)	61-70 yrs. (18)	$\bar{X}$			14.8	24.4	
		S			14.02	18.34	
	71-80 yrs. (28)	$\bar{X}$			17.2	19.9	
		S			12.52	12.89	
	81-90 yrs. (34)	$\bar{X}$			21.9	21.5	
		S			12.76	14.49	
LSI (0-19)	61-70 yrs. (18)	$\bar{X}$			7.4		
		S			4.80		
	71-80 yrs. (27)	$\bar{X}$			9.1		
		S			3.22		
	81-90 yrs. (31)	$\bar{X}$			8.7		
		S			3.95		

Life Satisfaction Index

The levels of reported general life satisfaction among the three age groups were equivalent with one another. The difference separating the three groups was 1.7 points. The lowest reported level was found among the 61-70 year and the highest among the 71-80 year olds. The variance was highest among the young olds and lowest among the middle olds.

The ANOVA yielded no significant age differences, i.e., the function of age did not have an influence on the results obtained (Table 35).

Psychomotor Performance Tests - Simple and Disjunctive RT

The longitudinal findings of SRT and DRT are described in this section. Table 37 presents the means and standard deviations of the three age groups for the five MP. The same information is graphically displayed in figures 12 and 13.

Characteristic of the SRT was the consistency of the mean response times within each series from one MP to the next for the three age groups. With the exception of two or three instances, the range of means within the respective age groups did not fluctuate more than .05 msec. In particular were the undeviating mean responses registered by the old old during the first series, and by the young old for both series, after eliminating the second series at MP 1. This regularity of mean responses was assimilated in the standard deviations of the three age groups. The vast majority of the standard deviations remained between .10 and .15 msec. throughout the two-year study. In addition, worth noting was the patterned change in mean RT from the first to the second

series of signals among the three age groups. The direction of change was almost always decremental and, on the average, the decrease in RT was approximately 5%. Finally, regarding intrasubject variability, over the five MP, approximately 31% of the samples' mean RT were within a range of .125 msec. An additional 8% and 5% showed either a deterioration or an improvement in RT, respectively. The rest of the sample manifested a marked amount of variability; some patients had broad undulating patterns, and others had U-shaped or inverted U-shaped patterns over the two year test period.

Age differences were apparent: the young olds had the shortest RT, except at MP 3, and the old olds registered the longest response times. The young olds reacted 5% faster on both SRT series in comparison with the middle olds, and 12% quicker than the old olds.

The ANOVA resulted in significant age differences (Table 39). On SRT 1 both the young old and middle old reacted significantly faster ($p < 0.01$) than the old. On SRT 2 the significant difference ($p < 0.05$) was attributed to the disparities in mean scores between the young old and old old. Significant overall time effects were not to be found on SRT 1 and 2. An inspection of the pair comparisons, however, revealed that on SRT 2 there was a significant increase in RT between MP 1 and MP 4. The increment during this time period for the age groups approached 12%. No age x time interaction effects were found (Table 39).

Likewise, similar points characterized the longitudinal findings of the DRT. Most outstanding was the likeness of the mean response times within each age group from one MP to the next. As with SRT, the vast majority of the mean responses did not exceed a range of .05 msec.

Most identical were those registered by the middle olds and old olds on the first series of signals throughout the two year study period. In addition, the standard deviations remained very constant for the two older age groups over the five MP, the majority falling between .11 and .15 msec.

Changes between the first series to the second series were practically microscopic. Those which did occur were usually increases. Averaged out, the 61-70 and 71-80 year olds increased their mean RT by 1% and the 81-90 by 3%. This type of variation reflected the time changes occurring, i.e., there were hardly any. Age-related differences, however, were evident. The young

Table 37

Simple and Disjunctive Reaction Time – Longitudinal Findings of Three Age Groups

MP Date		1 May '77		2 Nov. '77		3 Dec. '77		4 June '78		5 May '79	
SRT-series		1	2	1	2	1	2	1	2	1	2
Age groups (N)											
61-70 yrs. (18)	$\bar{X}$	0.44	0.39	0.44	0.43	0.47	0.45	0.46	0.45	0.44	0.44
	S	0.09	0.11	0.11	0.14	0.13	0.15	0.13	0.13	0.11	0.14
										(15)	
71-80 yrs. (28)	$\bar{X}$	0.45	0.43	0.47	0.43	0.47	0.45	0.49	0.50	0.50	0.47
	S	0.10	0.12	0.14	0.11	0.12	0.12	0.10	0.11	0.14	0.14
										(21)	
81-90 yrs. (34)	$\bar{X}$	0.50	0.46	0.51	0.48	0.50	0.47	0.52	0.50	0.51	0.50
	S	0.13	0.12	0.15	0.17	0.12	0.13	0.12	0.13	0.12	0.14
										(27)	
DRT-series		1	2	1	2	1	2	1	2	1	2
61-70 yrs. (18)	$\bar{X}$	0.51	0.52	0.58	0.59	0.56	0.58	0.58	0.57	0.61	0.61
	S	0.11	0.08	0.13	0.16	0.14	0.16	0.14	0.14	0.16	0.18
										(15)	
71-80 yrs. (28)	$\bar{X}$	0.61	0.64	0.63	0.61	0.62	0.61	0.62	0.63	0.62	0.64
	S	0.13	0.15	0.16	0.14	0.15	0.13	0.14	0.13	0.15	0.13
										(21)	
81-90 yrs. (34)	$\bar{X}$	0.62	0.66	0.62	0.62	0.61	0.62	0.63	0.66	0.63	0.64
	S	0.11	0.11	0.14	0.15	0.13	0.14	0.12	0.12	0.12	0.11
										(27)	

old responded consistently faster at every MP in comparison with the other two groups, who matched one another in terms of mean responses. The young old's DRT were roughly 8% faster. In terms of intrasubject variability similar trends were found on DRT as were on SRT.

Figure 12

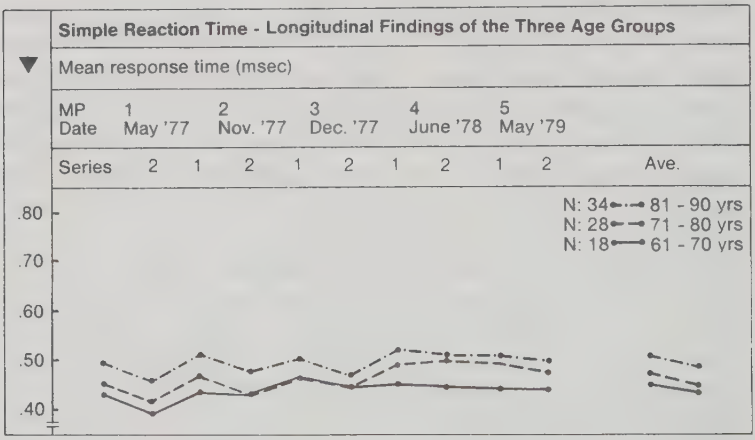
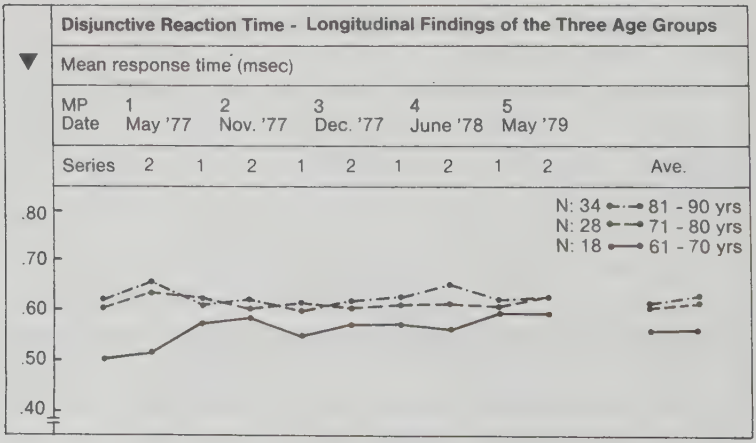

Simple Reaction Time - Longitudinal Findings of the Three Age Groups
Mean response time (msec)
MP 1 2 3 4 5
Date May '77 Nov. '77 Dec. '77 June '78 May '79
Series 2 1 2 1 2 1 2 1 2 Ave.
N: 34 81 - 90 yrs
N: 28 71 - 80 yrs
N: 18 61 - 70 yrs
.80
.70
.60
.50
.40

Figure 13


Disjunctive Reaction Time - Longitudinal Findings of the Three Age Groups
Mean response time (msec)
MP 1 2 3 4 5
Date May '77 Nov. '77 Dec. '77 June '78 May '79
Series 2 1 2 1 2 1 2 1 2 Ave.
N: 34 81 - 90 yrs
N: 28 71 - 80 yrs
N: 18 61 - 70 yrs
.80
.70
.60
.50
.40

The ANOVA confirmed the latter findings, i.e., there were significant age differences. On both DRT series the young old were significantly faster than the middle old and the old old. The levels on the two series were $p < 0.05$ and $p < 0.01$, respectively. Regarding the factor time no significant effects were observed. In addition, no interaction effects were found (Tab.39).

Continuous Performance Test - Addition

The longitudinal findings of this test are presented in Table 38 and graphically displayed in Figures 14 and 15. The test was performed on three occasions: MP 1, 3 and 4. The retest inverval was always six months. Due to time limitations at MP 3 and 4, it was only possible to execute one performance test. The addition test was chosen because it taps a higher level of cognitive functioning than does numerical matching, and is a more sensitive index of evaluation.

During MP 1 patients were tested for three minutes and at MP 3 and 4 the testing duration was extended to three and one-half minutes. For the purpose of comparison among the three MP, only the findings obtained through the first three minutes will be referenced.

The graphs in both figures clearly depict the parallelism in performance between the 61-70 and 71-80 year olds and the disparity between these two groups and the 81-90 year olds. These findings were more distinct at MP 3 and 4. Nevertheless, all age groups, on the average, steadily improved their mean output throughout the three minute testing session. The average increases in performance rate from the first to the last 30 seconds for the three age groups at the three MP in sequence were as follows: 61-70 year olds: 30, 38 and 25% increments; 71-80 year olds: 34, 26 and 29% increments; and the 81-90 year olds: 15, 11 and 32% increments. In terms

of cumulative performance, the 61-70 and 71-80 year olds matches one another and outperformed the 81-90 year olds by approximately 30% at each MP. The 61-70 and 71-80 year olds completed one problem every 2.7 seconds, whereas the 81-90 year olds averaged 3.5 seconds per problem.

Time effects were also found. Following the six months interval between MP 1 and 3 both the 71-80 and 81-90 year olds registered a 11% and 14% drop-off in total mean performance. This decrement, however, was absent six months later at MP 4, and both groups approached the performance level obtained at MP 1. The 61-70 year olds manifested no noticeable fluctuation in mean output from one MP to the next. If anything, there was a decrease in their variance at MP 3 in comparison with the other two.

The ANOVA endorsed these findings. Significant age effects, $P < 0.01$, were found. Pair comparisons demonstrated that both the 61-70 and 71-80 year olds performed at a higher level than did the 81-90 year olds. The factor time did not significantly alter the performance levels. Likewise, the analyses did not yield any signficant age x time interaction (Table 39).

SPMSQ

Mental status was evaluated at the beginning and close of the study. Reductions in cell sizes were noted in all three age groups. They were more pronounced in the two older age groups. At MP 1 the 71-80 year olds obtained a slightly higher mean score than the 61-80 and 81-90 year olds, who were somewhat comparable. Two years later, the survivors of the 61-80 and 81-90 year olds showed improvement, this improvement being more pronounced within the 61-80 age bracket. The 71-80 year

olds recorded a slight drop-off in their score at MP 5. Significant age and time effects were not found. Tendencies, however, were noted between the young and middle old in comparison with the old old. In both instances the old old received a lower score. No interaction effects were found (Table 38).

Table 38

Performance Tests – Longitudinal Findings of the Three Age Groups

MP Date			1 May '77	2 Nov. '77	3 Dec. '77	4 June '78	5 May '79
Tests (Range)	Age groups (N)						
ADD	61-70 yrs. (18)	$\bar{X}$	11.0		10.8	11.2	
		S	4.71		3.63	4.99	
	71-80 yrs. (28)	$\bar{X}$	11.8		10.6	11.5	
		S	5.50		5.32	5.73	
	81-90 yrs. (34)	$\bar{X}$	9.2		8.1	8.8	
		S	3.60		3.87	3.79	
SPMSQ (0-10)	61-70 yrs. (18)	$\bar{X}$	6.2				7.3 (15)
		S	2.58				2.39
	71-80 yrs. (26)	$\bar{X}$	7.3				6.9 (21)
		S	2.13				2.56
	81-90 yrs. (34)	$\bar{X}$	5.9				6.3 (27)
		S	2.36				2.97
CPM (0-36)	61-70 yrs. (16)	$\bar{X}$			21.4		
		S			6.34		
	71-80 yrs. (28)	$\bar{X}$			20.9		
		S			6.61		
	81-90 yrs. (25)	$\bar{X}$			20.5		
		S			5.96		

Table 39

Performance Tests – Age x Time ANOVA – F Ratios

Tests	SPMSQ	SRT-1	SRT-2	DRT-1	DRT-2	ADD	CPM
Effects							
Age (A)	2.74	6.81*	3.82+	4.39+	6.74*	8.61*	0.05
Time (T)	0.59	0.62	2.08	0.56	0.41	0.83	–
A x T	0.87	0.24	0.29	0.37	0.74	0.05	–

+ = $p < 0.05$
* = $p < 0.01$

Figure 15

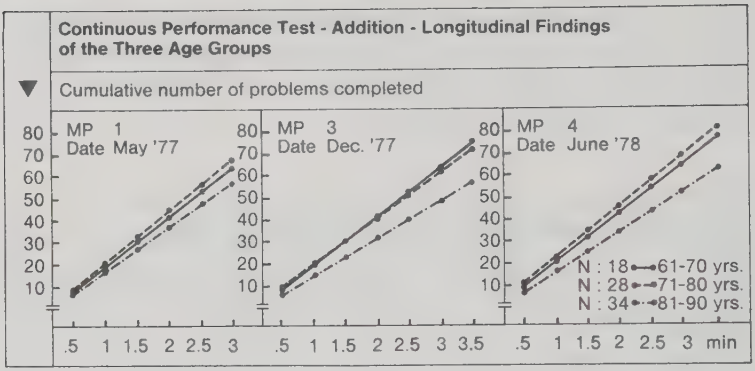
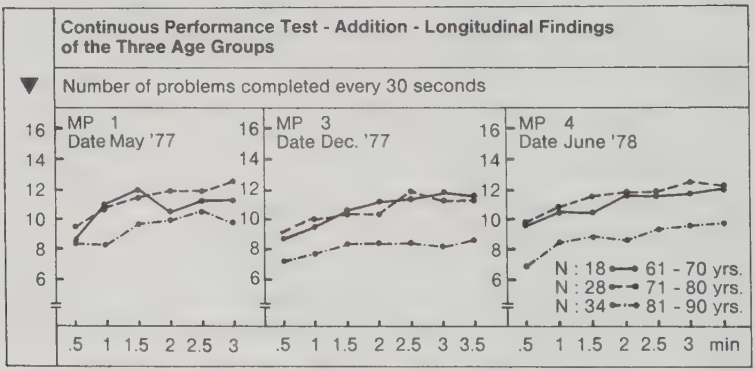

Continuous Performance Test - Addition - Longitudinal Findings of the Three Age Groups
Cumulative number of problems completed
MP 1
Date May '77
MP 3
Date Dec. '77
MP 4
Date June '78
N : 18 61-70 yrs.
N : 28 71-80 yrs.
N : 34 81-90 yrs.
.5 1 1.5 2 2.5 3 .5 1 1.5 2 2.5 3 3.5 .5 1 1.5 2 2.5 3 min

Figure 14


Continuous Performance Test - Addition - Longitudinal Findings of the Three Age Groups
Number of problems completed every 30 seconds
MP 1
Date May '77
MP 3
Date Dec. '77
MP 4
Date June '78
N : 18 61 - 70 yrs.
N : 28 71 - 80 yrs.
N : 34 81 - 90 yrs.
.5 1 1.5 2 2.5 3 .5 1 1.5 2 2.5 3 3.5 .5 1 1.5 2 2.5 3 min

CPM

The Progressive Matrices test was administered at MP 3 Findings were obtained on 87% of the longitudinal sample. Means and standard deviations revealed no differences among the various age groups in terms of fluid intelligence. Differences were never larger than one point. All three age groups identified correctly the missing cell in approximately 58% of the matrices. The pattern of response was fairly identical among the three age

groups, i.e., as the degree of difficulty increased on each set, namely from illustration eight onwards, more incorrect responses were given. No significant differences were found among the three age groups (Table 38).

VMT (short-term, long-term, and recognition memory). Memory assessments were made at MP 3 and 4. On STM the 71-80 year olds recalled more animated objects after one minute than the other two age groups and this was even more pronounced six months later. The young and middle olds recalled more items at the second MP in comparison with the first MP, whereas the old olds registered a slight decline. The same profile was found on the LTM task. The 71-80 year olds recalled more objects following a 7-10 minute pause than the others. Their LTM performance was substantially better at the next testing; the 61-70 year olds had no variation, and the 81-90 year olds had a 9% decline. Regarding recognition memory, the similar performance pattern was apparent. At MP 1 the age differences were slight. Six months later the 61-70 and 71-80 year olds showed an 11% improvement in recognition, whereas the old old had a 11% decline (Table 40). Significant age differences were found between the 71-80 and 81-90 year olds.

Table 40

Visual Memory Test – Longitudinal Findings of the Three Age Groups

MP Date		3 Dec. '77			4 June '78		
Tests		STM	LTM	RCG	STM	LTM	RCG
Age, groups							
61-70 yrs. (18)	$\bar{X}$	4.4	4.2	7.6	4.9	4.3	8.6
	S	2.25	2.96	3.85	2.49	3.32	2.91
71-80 yrs. (28)	$\bar{X}$	4.8	5.0	8.4	5.8	5.5	9.4
	S	2.32	3.02	3.32	2.60	2.87	2.61
81-90 yrs. (34)	$\bar{X}$	3.9	3.6	8.1	3.9	3.3	7.3
	S	2.26	2.65	3.23	2.66	2.71	3.31

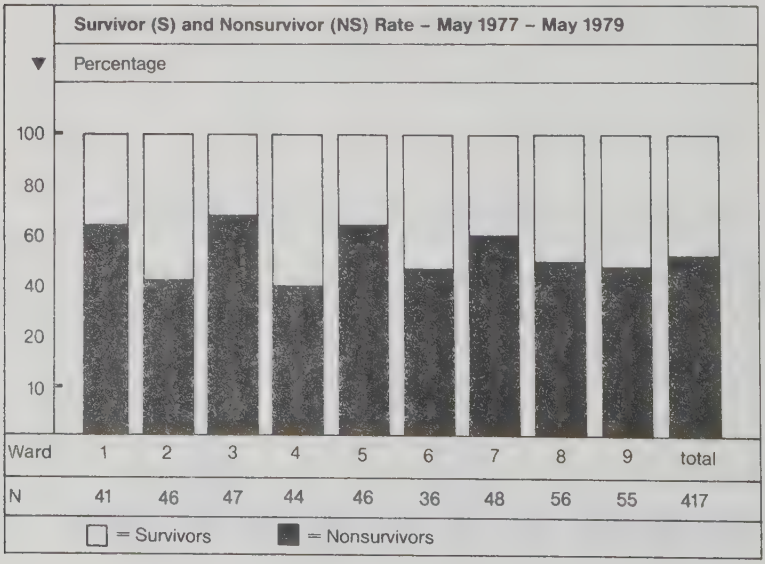
STM* = Short-Term Memory LTM* = Long-Term Memory RCG* = Recognition

Survivors and Nonsurvivors

At the conclusion of the study information was gathered regarding the mortality rate which occurred between MP 1 and MP 5, May 1977 to May 1979. These figures were available on 400 patients, i.e., 96% of the investigated sample. Table 41 illustrates this rate for the total sample and individually for the nine wards. During this time span 57% of the sample passed away. On four of the wards, 1, 3, 5, 7, the mortality rate was or exceeded 60% whereas for the remaining it hovered around 45%. The lowest rate, 40%, was recorded on ward 4, and the highest rate, 68%, on ward 3.

Additional information concerning the test results of the survivors and nonsurvivors obtained at MP 1 was computed and subjected to an ANOVA. Means and standard deviations of the respective behavorial rating scales and performance tests are found in tables 42 and 44.

Table 41



Behavioral Rating Scales

Nurses rated the survivors higher on all of the individual factors, and this disparity was reflected in the global mean score of the NOSIE. This differentiation was also found on the doctors' ratings, GRS. Survivors were ascribed lower ratings on each factor and the cumulative product of this is observed in the two groups' composite mean score. Nonsurvivors obtained markings on both rating scales indicative of more functional impairment (Table 42).

The ANOVA supported this by demonstrating that nurses and doctors distinguished significantly between nonsurvivors and survivors. Results revealed that the survivors were considered to be functioning at a more competent level (Table 44).

Performance Tests

On the two motoric tests, SRT and DRT, survivors registered shorter response times. On SRT the difference between the two was more pronounced during the second series of signals. Both groups shortened their mean RT from the first to the second series with the decrement slightly favoring the survivors. Regarding the DRT, the mean difference was similar on both series and both groups had similar increments from the first to the second trial. In the ANOVA, the strongest contrasts between survivors and nonsurvivors occurred in the second series of SRT and on both trials of DRT. Differences were significant at the 5% level.

On the continuous performance tasks, NM and ADD, the similar pattern was observed, i.e., survivors completed more matching and simple arithmetric operations in a three minute period than the nonsurvivors. In both instances

their performance output exceeded the nonsurvivors by approximately 18%. The ANOVA supported these findings. On both tests significant differences were noted at the 1 percent niveau.

Regarding the SPMSQ, the difference was slight between the two groups and favored the survival group. No significant difference was found, however, between the two groups.

Table 42

Survival and Length of Hospitalization Findings

Groups		NS**	S**	0-12***	13-35***	+36***
N		210	190	141	143	116
(%)*		(45)	(67)	(57)	(51)	(64)
Age	$\bar{X}$	80.0	78.8	79.3	80.1	78.6
	S	6 9	7 9	6 8	6.9	8.9
Tests						
NOSIE	$\bar{X}$	160 4	170 3	164 3	164.6	168 0
	S	22 1	21 1	23 2	21.0	21.4
GRS	$\bar{X}$	23 1	17 6	21 8	19 9	19 1
	S	10 9	9 9	10 4	10 35	10 78
SPMSQ	$\bar{X}$	6 1	6 6	6 1	6 3	6 6
	S	2 59	2 40	2 78	2 31	2 31
SRT I	$\bar{X}$	0 57	0.55	0 58	055	0.55
	S	0 16	0 17	0 16	0 15	0.17
2	$\bar{X}$	0.52	0 47	0 49	0 50	0 48
	S	0 16	0 16	0 15	0 16	0 17
DRT I	$\bar{X}$	0 68	0 64	0 66	0 65	0.66
	S	0 16	0 17	0 15	0 16	0 16
2	$\bar{X}$	0 69	0 66	0 68	0.65	0.68
	S	0 15	0 15	0 14	0 14	0 16
NM	X	10.6	12.5	11 3	11 1	12.2
	S	4 39	4 94	4 56	4 65	4 71
ADD	$\bar{X}$	8.2	9 8	8 7	9 3	9.5
	S	3 75	4 70	3.89	4 61	4.6

* (%) = Percentage of patients who completed the psychological tests
** NS = Nonsurvivors; S = Survivors
*** = Lenght of hospitalization in months prior to MPI, May '77

Length of Hospitalization

Also at the close of the study a check was made regarding the patients' length of hospitalization prior to the commencement of the study. Patients were grouped into one of the three categories: (a) those who had been living at the IWH less than 12 months, (b) between 12 and 36 months, and (c) over 36 months. Based on available data from 400 patients the findings demonstrated that 141 patients (35%) had been hospitalized for less than one year, 143 patients (36%) between one and three years, and the remaining 116 patients (29%) had been there over three years. The median length of hospitalization at the IWH prior to the beginning of the study in May 1977 was approximately two years.

Results obtained at MP 1 on the behavioral rating scale and performance tests were derived for these three groups and were then analyzed in order to determine the effects of the length of hospitalization. The respective means and standard deviations of three groups are presented in table 42.

Behavioral Rating Scales

When the sample was sub-divided according to their length of hospitalization, no differences were visible among the three groups based upon the nurses' ratings. The global mean scores did not vary by more than four points. Likewise, the mean range of the individual factors never exceeded two points among the three groups. This pattern of deviation was duplicated by the ward doctors. That is to say, when mean scores of GRS were computed for the three groups, no visible differences were rated on the composite score or on the individual factors. The difference among the mean scores barely approached three points among the three groups.

The ANOVA confirmed these findings, i.e., when the sample was sub-divided according to length of hopitalization neither nurses nor doctors distinguished among the formed groups in terms of behavioral ratings ascribed.

Performance Tests

On both motoric performance, SRT and DRT, no discernible differences were found among the three groups. Not once was their mean response difference larger than .03 msec. The only change suggestive of anything was that noted on the decremental decrease from SRT 1 to SRT 2. The group hospitalized for less than 12 months registered a slightly larger decrement than the other two groups.

On the continuous performance tasks, the group living the longest at the IWH performed slightly better than the other two. This was more noted on the numerical matching test: they completed 9% more in the allotted time. This trend was also present on ADD and SPMSQ.

These differences, however, as well as any variations on SRT and DRT did not result in any significant discrepencies among the three groups who varied in the length of hospitalization.

Interaction Effects

These results along with those obtained from the non-survivors were then computed together in a two-factor ANOVA: factor one: survial; factor two: length of hospitalization. These effects and interactions (F ratios) are presented in Table 44. In addition, in order to better visualize any interaction effects the means and standard deviations for the respective groupings are shown in table 43. Addressed here are only the interaction effects.

Interaction tendencies were noted on the behavioral rating scales. Nurses and doctors assigned similar ratings to the survivors and nonsurvivors who had been hospitalized for less than one year. But as the length of hospitalization increased, a greater disparity was found between survivors and nonsurvivors. Survivors were assigned more favorable ratings in relation to the length of their hospitalization, and nonsurvivors received less favorable ratings in relation to the length of their stay. This latter trend was more reflected in the nurses' ratings. Thus, patients who had been living longer at the IWH prior to the beginning of the study and who were still alive at the conclusion were appraised more favorably. Nonsurvivors, on the other hand, tended to receive overall lower ratings in relation to the length of their hospitalization.

Interaction effects on the motoric performance tests, SRT and DRT, were evident. The combination of survival and length of hospitalization resulted in decremental decreases in response times, whereas the combination of nonsurvival and length of hospitalization yielded the reverse. That is to say, nonsurvivors who had been hospitalized the longest had the slowest RT. On the other hand, among the survivors, those who were first year residents recorded the longest response times. This pattern was characteristic on both types of RT tests.

Regarding the Pauli performance tests and SPMSQ, no interaction effects were found. Nonsurvivors, regardless of the length of their stay, performed in similar manners while survivors, on the average, showed a slight increment in performance in relation to the length of their stay.

Table 43

Survival and Length of Hospitalization – Interaction Scores								
Groups (Length of hospitalization)*		0–12 months		13–36 months		over 36 months	
N (%)		141		143		116	
Nonsurvivors (NS)		NS	S	NS	S	NS	S
Survivors (S)		(57)	(43)	(52)	(48)	(43)	(57)
Tests							
NOSIE	$\bar{X}$	163.1	165.9	157.6	172.1	160.6	172.8
	S	22.9	23.8	21.7	18.4	22.1	21.0
GRS	$\bar{X}$	22.7	20.6	22.9	16.7	23.8	15.8
	S	10.7	9.8	10.7	9.7	12.1	9.8
SPMSQ	$\bar{X}$	6.1	6.0	5.6	6.7	6.5	7.0
	S	2.79	2.79	2.36	2.23	2.50	2.23
SRT 1	$\bar{X}$	0.56	0.60	0.58	0.52	0.63	0.52
	S	0.15	0.18	0.13	0.17	0.19	0.15
2	$\bar{X}$	0.49	0.50	0.55	0.46	0.55	0.45
	S	0.15	0.15	0.16	0.16	0.18	0.16
DRT 1	$\bar{X}$	0.65	0.68	0.71	0.62	0.71	0.63
	S	0.14	0.16	0.16	0.17	0.16	0.16
2	$\bar{X}$	0.67	0.69	0.71	0.62	0.72	0.66
	S	0.14	0.15	0.15	0.14	0.17	0.16
NM	$\bar{X}$	10,7	11,9	9.9	12.2	10.3	13.0
	S	4.55	4.56	4.49	4.78	3.81	5.39
ADD	$\bar{X}$	8.2	9.0	8.0	10.3	7.9	10.2
	S	3.74	4.03	4.29	4.90	2.51	5.01

* = Lenght of hospitalization in months prior to MP I, May '77

Table 44

Survival and Length of Hospitalization – F Ratios									
Tests	NOSIE	GRS	SPMSQ	SRT 1	SRT 2	DRT 1	DRT 2	NM	ADD
Effects									
Survival (S)	19.21*	24.91*	$3.07^{(+)}$	2.49	5.71*	3.68^{+}	3.98^{+}	8.49*	7.52*
Hospitalization (H)	0.35	0.60	1.19	0.48	0.16	0.04	0.67	0.41	0.37
S x H	$2.75^{(+)}$	$2.73^{(+)}$	0.79	4.28^{+}	4.42^{+}	3.34^{+}	1.83	0.75	0.63

(+) = p≤ 0.10
\+ = p≤ 0.05
* = p≤ 0.01

In the ANOVA, the strongest interaction effects were found on the motoric tests. On both SRT and the first series of DRT significant interaction effects $p = 0.05$ were manifested between survival and length of hospitalization. Similar trends, $p < 0.10$ were observed on both behavioral rating scales, NOSIE and GRS.

SUMMARY AND DISCUSSION

This chapter identifies and summarizes the major cross-sectional and longitudinal findings as well as their limitations and applicability. It discusses the results in relation to the stated assumptions and hypotheses and compares them with the theories and research which have been described in the literature review. Behavioral observations of general institutional functioning as measured by behavioral rating scales are analyzed first. Behavioral processes as assessed by various psychomotor and performance tests are then addressed. Detailed descriptions of these variables are found in the methodology.

In short, it was assumed that the rating scales were indices of functional competency in terms of physical, social, and psychic functioning. Perfomance on the psychomotor and continuous ability tests were considered to be indices of behavioral processes mediated by the CNS. Central mechanisms involved in the chain of events occurring during these tests were perception, cognition, and motor activity. Simple reactions and tests were more dependent on sensory and motor mechanisms, whereas complex behavior such as disjunctive reaction time and addition were, in addition to sensory and motor mechanisms, more dependent on central ones.

Major Findings of the Cross-Sectional Study

The aim of this section of the study was to delineate all residents in a long-term care facility for the aged.

The methodology consisted of behavioral rating scales designed to evaluate behavioral observations of general institutional functioning and psychometric instruments employed to assess behavioral processes mediated by the CNS. In addition, distinctions were made on the results obtained among the young old (61-70 years), middle old (71-80 years), and old old (81-90 years). Due to the emergence of chronic diseases and disabilities of late life, particularly among the institutionalized, it was hypothesized that similar age-related decrements would be reflected on the doctors' and nurses' behavioral ratings. Likewise, similar hypotheses were put forth for the performance tests, i.e., there would be incremental increases in speed of response on the psychomotor tests and decremental decreases on the performance tests. Finally, as the requirements of the tests were increased, thereby involving a higher level of the CNS, there would be a disproportionate slowing with age.

Behavioral Rating Scales

The major findings of the present study with regard to the behavioral rating scales, NOSIE, and GRS, were as follows:

1. Nurses and doctors significantly differentiated in terms of general functional capacities between patients who completed the battery of psychological tests and those who did not (tested vs. non-tested).

2. Significant age-related differences were obtained on two of the six factors assessed by the ward doctors, but were not found on the composite

score. Nurses, on the other hand, did not discriminate on any of the areas assessed as a function of the variable age.

3. Sex-related differences were found on three factors for both the nurses' and doctors' ratings. In addition, doctors distinguished between males and females on the composite score.

Regarding point one, it is apparent that the tested sample was perceived as being socially more interactive and more competent in performing activities of daily living. The direction of these findings indicates the harmony between nurses and doctors in assessing general institutional functioning when the group was dichotomized into the non-tested and tested samples. It is recalled that these evaluations were made prior to the commencement of the psychological testing phase, and thus neither the nurses nor the doctors knew who would complete these tests. It appears, therefore, that certain indices of behavior manifested by the tested sample were observed by the raters and associated with successful completion of the performance tests. Patients recognized as being more sociable, more competent in performing activities of daily living, and having less sensory impairment, were more capable, willing, and more than likely motivated in completing a battery of psychometric tests.

Such findings were expected, even though identical studies employing the same tests and design have not been reported in the literature. As noted in the methodology section a pre-requisite for continuation in the study was that the patients be both consenting and

capable of completing a battery of psychological tests. It was assumed that the possession of such abilities would reflect a greater degree of functional competency and that this would be demonstrated in the nurses' and doctors' ratings. Evidence has been presented indicating that both scales, NOSIE and GRS, are sensitive in differentiating among geriatric patients varying in their degree of functional capacity (Honigfeld, 1974; Dastor et al., 1975; Plutchik et al., 1970; Smith, 1979). These findings are an additional indicator of the sensitivity of these scales in distinguishing among geriatric patients who vary in their degree of functional capacity. In addition, it appears that the utilization of this test battery as a screening device may be a potential means of estimating the functional competency of geriatric patients.

With regards to point two, the factor age, the findings imply that nurses were not influenced by the age of the patient when evaluating his or her ward behavior, whereas doctors, even though not consistently influenced on every factor, demonstrated tendencies pointing in this direction. It appears that doctors were more swayed by the patients' age in the area of social and sensory functions, and in both instances increased functional impairment was associated with advancing age. It is noted, however, that the doctors' ratings from the AGP on similar parameters do not totally support those findings. Age-related decrements in sensory functions were apparent only in hearing.

It was assumed that the nurses' and especially the doctors' ratings would suggest an age-related increment in terms of functional disabilities. That is to say, they

would assess behavior more in terms of the medical model and associate advancing age with a greater degree of functional impairment. Such presumptions were based upon the notion that both groups of raters would be influenced by their prior medical training, their expectations of the health status of the elderly, and common myths and stereotypes applied to older people (Bulter, 1975; Karasu, Stein & Charles, 1979; Spence, Feigenbaum, Fitzgerald et al., 1968). The findings, however, do not support these assumptions. Rather, they suggest that nurses formulated their opinions upon the patients' level of functioning and not their respective age. Doctors, on the other hand, were influenced only in the areas of social dysfunction and sensory acuity. The late findings, i.e., visual and auditory functions, have been well documented to show evidence of decline with age (Corso, 1977; Fozard et al., 1977; Ordy & Brizzee, 1979; Ordy et al., 1979).

It is also of interest to note that in extensive reviews of the literature addressing the rating scales used with the elderly (Kochansky, 1979; Salzman, Shader, Kochansky, Cronin, 1972; Smith, 1979), the relation between age and the status of the patient's behavior were seldom reported or discussed. It is concluded that either the factor age was not an influential variable and thus, no mention of the findings were made, or that the age of the patients was not considered by the investigators as having the potential to modify behavioral ratings. The present findings support this notion. That is to say, nurses and doctors were not influenced by the age of the patients when assessing the degree of their general institutional functioning.

Regarding point three, it is evident that nurses and doctors observed sex-related differences, but that the direction of these disparities in terms of functional competency did not compliment one another. The nurses distinguished between the sexes by indicating that the females were functioning at a slightly more competent level, namely in the area of social interest. Doctors, however, evaluated the males in a more favorable light, e.g. male patients were seen as more competent in activities of daily living, socially more interactive, and more helpful with ward chores. Prior research concurred with the findings of the doctors' ratings (Meer & Baker, 1964; Smith et al., 1977); females were assigned ratings indicative of more impairment in activities of daily living. A discrepancy exists with this literature, however, concerning the GRS total scores: No significant sex-related differences were observed by Plutchik et al. (1970) and Smith et al. (1977) in the composite scores, but in the present study there was a significant sex difference on the total GRS score.

No definite assumptions were formulated regarding sex differences due to the paucity of research addressing this question. An inspection of the means and standard deviations suggests that the sex differences are more quantitative and not qualitative, and may be the result of the differences in the cell size, i.e., as the size of N increases, the likehood of finding significances is also greater. This explanation is also supported by the fact that significant findings obtained on other factors, e.g., non-tested, are substantially larger. It is concluded that even though sex differences were obtained, it is more realistic to consider them as quantitative and not qualitative.

In overview, the findings of the behavioral observations of general institutional functioning were analyzed from three perspectives. It was assumed that such an approach would shed light on how ward nurses and doctors perceive their patients and which, if any, of the factors influence their judgments. The most sensitive factor in discriminating the nurses' and doctors' ratings was the dichotomy tested vs. non-tested. Patients possessing the skills to perform certain psychometric tests manifested certain traits which were recognized as indices of functioning on a more competent level. Also, the factor sex had an influence on the ratings ascribed by the nurses and doctors. However, due to the small numerical differences between males and females, these changes are viewed as being more quantitative than qualitative. With regards to age, doctors were more influenced by the age of the patients in the area of social dysfunction. They associated advancing age with a constriction in social interactions. Since doctors also associated aging with a decrease in sensory functions, it is possible that they viewed these deficiencies as restricting the degree and scope of the elderly's social interactions.

It is concluded that behavioral rating scales are sensitive instruments in assessing institutional functioning of geriatric patients. In addition, these behavioral observations are not meaningfully influenced by either the age or sex of the patient; rather, the variance is explained predominantly by the patients' degree of functional competency in terms of physical, social and psychological functioning levels.

Limitations of the Behavioral Rating Scale Findings

By the same token, it is necessary to take into account the limitations of the methods employed when interpreting the results. Observations of the patients' ward behavior were based upon behavioral rating scales which are subjective in nature. Certain factors are suggestive of modifying the raters' perception, such as their age, school of thought, theoretical orientation and attitude towards the population being treated (Katz, Cole & Lowery, 1969; Karasu et al., 1979; Lazare, 1977; Yager, 1977). In addition, the use of these instruments is subject to errors of central tendency and leniency errors (Anastasi, 1976).

The variance created by the first set of factors is difficult to determine. The nurses, with the exception of one, were in their forties and all had been working at the IWH for at least five years. It can, therefore, only be assumed that they showed a humanistic approach towards the elderly and that the passage of time made them more analogous with one another in terms of theoretical orientation. The doctors, on the other hand, were more varied in terms of average age, ranging from mid-thirties to the beginning sixties. This alone implies that their school of thought and theoretical orientation were not in accord with one another. In addition, half of them had specialized. Their length of employment also varied widely from a few years to many years. On the other hand, the common denominator was that they all had chosen to work in the field of geriatric medicine and all volunteered to take part in the study. In addition, when they were interviewed at the onset of the study all of them expressed an interest in geriatric research and participated willingly in the pilot meetings.

Regarding the measurement problems, namely errors of central tendency and leniency errors, information is acquired by scrutinizing the means and standard deviations of the factor scores (see tables 18 and 20). It is recalled that the items of the NOSIE carry 5 allowable rating points and the items of the GRS carry 3 allowable rating points. Neither the nurses nor the doctors seem to be guilty of errors of central tendency, i.e., they do not consistently place persons in the middle of the scale. On two of the NOSIE factors, there is a slight tendency for nurses to rate in this format. What is more apparent is that both raters avoided assigning unfavorable ratings. Instead, they ascribed ratings indicating that the degree of severity was minimal. This style of rating applied mainly for the factors manifest psychosis and depression (NOSIE) and for the factors aggressiveness and sleep disturbances (GRS).

Leniency errors and errors of central tendencies tend to make evaluations similar. The fact that the distribution of ratings was significantly different between the non-tested and tested samples, and was not so apparent among the three age groups and between the sexes, suggests that if such errors are present, they are not so strong as to obscure the sensitivity of the scales in differentiating among geriatric patients varying in the degree of functional competency.

Applicability of the Behavioral Rating Scale Findings

As illustrated in chapter one under the heading institutionalization, pp. 29-45, the main characteristics of

institutionalized residents were as follows:

1. The average age is between 77 and 81 years; 70 - 75% are over 70 years.
2. Approximately 70 - 75% are female.
3. Approximately 80% are widowed and/or single.
4. The vast majority have multiple disabilities and need, on a daily basis, basic care and nursing services.
5. More than 50% have three or more chronic medical diagnoses.
6. Approximately 30% have moderate to severe cognitive disturbances.

A summary of the characteristics of the entire IWH is as follows:

1. The average age is 78; 80% are over 70 years.
2. Approximately 80% are females.
3. Approximately 64% are widowed, and an additionnal 24% are either divorced or single.
4. More than 60% are in daily need of self-care and help in performing activities of daily living; in the majority of the cases these difficulties are viewed as being moderate to severe.
5. Approximately 54% have at least three chronic medical conditions, and an additional 27% have at least two diagnoses.
6. Around 30% have memory disturbances; more than 50% have difficulties in concentration, comprehension and thought processes.

7. More than 50% have visual and auditory difficulties to various degrees, and approximately 80% have some degree of difficulty with their cardiovascular system.
8. Approximately 15% are considered as having good global bodily health, 60% as having fair and 25% as having a poor global bodily health status. (Regarding the last two points, information was not found in the literature describing these areas for the general institutionalized resident.)

A comparison of the features among the general institutionalized residents with the profiles presented on the entire IWH sample suggests that the IWH sample is comparable with the "typical" portrait of institutionalized residents. That is to say, in terms of demographic data and health status the IWH sample appears to be representative of other institutionalized samples, thus implying that the cross-sectional findings obtained may be generalized to other institutionalized samples.

However, since only half (53%) of the IWH sample completed the psychological performance tests at MP I, (see Methodology pp. 86-90), and in light of the significant differences obtained on the behavioral rating scales, it seems desirable also to view the applicability of the findings from the perspective of the non-tested and tested.

In terms of average age, sex ratio and marital status, both the non-tested and tested sample are quite comparable. Differences, however, are more observable in the

areas of cognitive processes, self-care competency and activities of daily living, global bodily health status, and number of chronic medical conditions. In each instance the degree of severity was more marked among the non-tested sample. These observations, coupled with the other salient behavioral rating disparities, provide evidence that the two subsamples differ substantially from one another. Additional documentation of these differences may be obtained by comparing the profiles of the non-tested and tested samples, NOSIE-Table 18, p. 95, and GRS-Table 20, p. 98, to those presented as reference data, Tabele 8. p. 66. An inspection of the scores reveals that the profile of the non-tested sample is quite similar to that of the nursing home sample with a psychiatric diagnosis, and also to that of the hospitalized geriatic patients for the GRS. The profile of the tested sample, on the other hand, differs considerably from the samples presented in this table.

The resulting picture suggests that the tested sample is functioning at a more competent level in terms of physical health, sociability, and cognitive processes. It is postulated that the combination of these states resulted in the successful completion of the psychological tests. Viewed from the other side, it appears that the mixture of having multiple disabilities, being more dependent on others in performing activities of daily living, being more socially withdrawn, and having a greater degree of cognitive impairment resulted in an inability to perform psychological tests. It is apparent, therefore, that within the IWH population there are at least two distinct subsamples functioning at different levels of competency.

The fusion of these two samples is commonly referenced as the "typical" institutionalized population. That is to say, institutionalized samples are normally viewed as conglomerates. In part this position is correct, namely in the areas of average age, sex ratio and family status. A shortcoming of this line of thought, however, is that one overgeneralizes and conceptualizes all aspects of institutionalized residents as being homogeneous. The findings of the present study do not support such a premise, but rather advocate that such populations are more heterogeneous, especially in terms of functional competency. Therefore, even within this small segment of the elderly population, interindividual differences/variability are prominent, thus supporting the claims of many investigators (e.g., Baltes, 1973; Palmore, 1974; Thomae, 1976) that a life time of experiences increases individual differences. In other words, an important aspect of the aging process is that interindividual differences manifest a tendency to increase with time and age and thus results in less age-related homogeneity. And more important, these behavioral processes also characterize this sample.

Returning to the question concerning the applicability of the findings to other institutionalized samples, it is speculated they are germane. First of all, it is apparent that the profile of the entire IWH sample resembles the typical portrait of other samples described in the context of age, sex, family status and number of chronic conditions. Secondly, since there is a lack of empirical studies which have attempted to delineate an entire institutionalized sample via behavioral rating scales and performance tests, it can only be theorized

that a similar degree of functional variability within the sample would have been demonstrated. Therefore, it is hypothesized that features characterizing the normal aging process across the life cycle also extend beyond these boundaries and are, to a certain degree, apposite for institutionalized samples. That is to say, within the vast majority of institutionalized populations the greatest degree of variance would be obtained on measurements of functional competency, whereas the degree of variability on demographic data would be minimal.

Perfomance Tests

The major findings of the cross-sectional study regarding the reaction time measurements (points 1 to 5) and continuous performance tests (points 6 to 9) were as follows:

1. Significant age differences were obtained on both series of SRT and DRT. On each series there was a lengthening of the response time with advancing age.

2. Significant sex differences were found on both series of SRT and DRT. Males always registered quicker response times.

3. The intersubject variability on SRT increased with advancing age.

4. Marked decrements in SRT were found from the first series to the second series of signals among the three age groups. This positive transfer from the first to the second series was not found on the DRT series.

5. No significant age or sex differences were obtained when the mean differences and ratios between DRT and SRT were contrasted. The differences among the three age groups approximated one another.

6. Significant age differences were obtained on both the matching and addition tests. On each test, there was a decrease in performance output with advancing age.

7. Significant sex differences were not obtained on either of the perfomance tests.

8. The intersubject variability was smallest among the oldest age group on both tests.

9. Significant age differences were found on the mental status questionnaire; no sex differences were found.

Psychomotor tests. The results of the SRT suggest that with advancing age there was a proportional increase in mean latencies and standard deviations. These symmetrical lengthenings also remained constant from the first series to the second despite the fact that there was a similar decrease in mean response time within each age group. These prolongations provide evidence that there is a lessened ability to maintain a state of functional readinesss with advancing age.

The findings of the DRT were generally not consistent with the results of the SRT. Even though significant age differences were obtained, there was not the pro-

portionate lengthening in mean latencies and standard deviations with advancing age. Rather, the variation was more explained by the marked increase in DRT among the old old in comparison with the other two groups. In addition, there was a distinct difference between SRT and DRT with regards to the training effects occurring between the first and second series of signals. In SRT there were substantial training effects observed, whereas in DRT there were no apparent ones. It appears that the intervening variables involved in DRT, e.g., decision-making processes, irrelevant material, may have had an inhibiting effect on the perfomance rate - thus blocking the process of facilitation. In SRT, since patients did not have to contend with these variables, i.e., they did not have to make a decision after perceiving the stimuli, they were able to facilitate their response patterns throughout the presentation of the SRT signals.

The findings of the SRT tests were expected, but those of the DRT were not. It is noted that assumptions and expectations were derived primarily from research conducted with elderly community residents, the reason being the scarcity of data investigating these parameters with institutionalized elderly patients.

It was assumed that age-related changes would be found and that they would be more pronounced for DRT (see Botwinick, 1973; Fozard & Thompson, 1975; Welford, 1977 for reviews). This was based upon the notion that with aging, response times would be slowed disproportionately as the complexity of the task increased, and this disproportionate slowing would be attributed to age-related difficulties in: (a) decision-making processes,

(b) inability to attend to irrelevant material, (c) need to monitor signals and responses longer when the movements cannot be prepared in advance, and (d) not solely to the functions involved in SRT.

The findings of this part of the study were not consistent to those views expressed in the literature, and additional clarification is obtained when the mean differences and ratio between DRT and SRT are discussed, see Table 27, p. 117. These values reflect the decision processes or components involved in retrieving the stimulus code and the selection of the response (Fozard et al, 1976; Waugh et al., 1973) or as referenced by Welford (1977) - the translation mechanism - the translation of data into action by triggering a decision and computing a response. The results of this analysis yielded no significant age differences. This finding provides evidence that there is no disproportional prolongation of RT as the complexity of the task increases. Thus, no systematic age-related differences in the decision making components of DRT were observed. There was an overall slowing with advancing age on both SRT and DRT, but the rate of slowing with increased choice did not vary among the age groups; rather, there was a slight proportional decrease with advancing age.

It appears that the significant age-related differences in SRT and DRT reflect impaired efficiency in initiating responses rather than triggering a decision and computing a response. It is concluded that the psychomotor components involved in making the responses increases with age, while the decision-making component of DRT becomes more variable especially among the young old in institutionalized elderly patients. The find-

ings are therefore not consistent with the hypothesis that DRT and its related components, namely decision making processes, would be more sensitive in demonstrating age-related cognitive decline.

The findings of the SRT and DRT regarding the factor sex are consistent with one another. Men were always quicker than females on each series. Observable training effects were the same for men and women. They were found on SRT, but there was no apparent change in DRT suggesting that the intervening variables affect males and females in identical fashions.

These findings concurred with those reported by Botwinick & Thompson (1966, 1967) and Mathey (1976), but not those reported by other investigators (Botwinick & Storandt, 1974; Botwinick & Brinley, 1962; Ferris et al., 1974). They found no sex differences; however, they suggested that perhaps sex differences would be seen in population samples older than those tested here (mean age 70 years). They also speculated that the sex differences reflect the different experiences and working backgrounds of men and women. It is noted in this study that females were considerably older that the males and the sex differences may well be an artifact of the variable age.

Regarding the sex and task complexity, it appears that males and females responded more or less the same. The data are viewed in the same light as were the age-related findings. The main source of variance differentiating males and females is the psychomotor components of RT, and the decision-making components become slightly more variable among the males.

Continuous perfomance tests. The results of the continuous perfomance tasks suggest there exists a similarity between NM and ADD in terms of mean perfomance and learning ability with regards to advancing age. On both tests the cumulative profile or average number of problems solved imply there was an age-related deficit. By inspecting these indices it is revealed that there is a disproportionate decrement in mean perfomance rate. In other words, the decrement separating the middle old and old old is twofold - that which separated the young old and middle old. The intersubject variability, however, did not reflect this pattern.

When focusing, however, on the learning ability or rate which occurs from the beginning to the completion of the test, one is not able to conclude that there are age-related decrements. On the contrary, the gradients of the curves indicate a similar learning pattern from one 30 sec. period to the next among the three age groups. Even more striking was that on the simpler task NM; age-related increments in perfomance ability were noted. On the simple computations, all three age groups again manifested substantial increases in learning rates, but it was not as pronounced this time for the 81-90 year olds.

When analyzing the data from the perspective of the mean differences or cumulative products among the three age groups, one has the impression that there are age-related deficits in learning perfomance. If one shifts the focus from the external product and concentrates on the internal process occurring during the test, one is left with the impression that all three age groups had a similar ability in grasping the con-

cept of the test and in performing at the same pace. Since the mean perfomance rate reflects a person's response rate or the non-cognitive aspects of the task, and the learning rate reflects a person's ability to learn, or the cognitive aspects of the task (Botwinick, 1973), it can be argued that no age-related deficits are found in learning ability; rather, they are observed in the area of initiating responses. In addition, it appears that the practice or training effects which occur throughout this test result in a positive transfer from one time-segment to the next. Hultsch, Nesselroade & Plemons (1976) suggest that this type of practice or training may result in an increase in cognitive organization or learning to learn.

Additional supportive evidence of this notion is found when comparing the mean differences and ratios between NM and ADD. Carroll (1974) notes that NM is dependent on perceptual fluency and decision speed, and ADD involves these components plus the addition of number facility. This extra component includes the process of retrieving appropiate number associations from long-term memory and performing serial operations on the stimulus material using these associations. Using this as the premise it was assumed that age-related decrements would be found and more pronounced in the ADD test. This would be due to a retrieval difficulty (the recovery and utilization of stored information (Botwinick, 1973), and reflect the older individual's need for additional time to search for, recover, and produce a stored response.

This assumption was examined by contrasting the three age groups' mean differences (NM - ADD) and the ratios

(NM/ADD). The results yielded no significant differences. These findings provide evidence that as the complexity of the task is increased, i.e., by incorporating an additional step involving retrieval, no age-related deficits are found in learning ability. Thus, there was no systematic change found which would have indicated that with advancing age there would be a need for more time to search for, recover, and produce a response. Such findings imply that the central mechanisms, e.g., information processing, are less influenced by advancing age, whereas the sensory and motor ones are more so within this particular sample.

Sex-related findings on the continuous perfomance tests suggest that in terms of mean performance rates males completed approximately 20% more than females. This ratio was similar on both tests. The intersubject variability of males and females matched one another. Shifting the emphasis onto the learning ability, it is apparent that males and females parallel one another on this aspect. The increases in learning rates for males and females were similar on both types of continuous performance tests.

These findings are viewed in the same light as were the age-related results. The main component differentiating male and females is the non-cognitive aspect, i.e., in the area of initiating responses, but in the area of learning ability no sex-related differences are found. In terms of perfomance, males initiated responses somewhat faster, however, in terms of learning ability, both sexes executed and computed decisions at the same pace. No sex-related perfomance decrement could be attributed to a retrieval difficulty, therefore implying

that males and females use the same amount of time when searching for, recovering, and producing a stored response.

A Comparison between the psychomotor and the continuous perfomance tests. As described earlier (see p. 76) a comparison between these two types of pacing tests allows one the possibility to examine the effect the manipulation of the stimuli has on the response patterns and performance rates within and between the three age groups. Such a procedure provides information on how the stimuli are being centrally processed and acted upon (Arenberg & Robertson-Tchabo, 1977; Atkinson & Shiffrin, 1968).

It is apparent that regardless of the level of task complexity or type of pacing, the 61-70 years olds always registered the quickest RT and obtained the highest perfomance rates, and the 81-90 year olds were always on the other extreme. Focusing on the simple tests, SRT and NM, a distinct difference was found in that on stimulus-paced tests intersubject variability increases with advancing age, whereas on self-pacing tests this variance decreases with advancing age. The stimulus-paced findings are more in accordance with the conclusions formulated by Talland (1965), i.e. older subjects are more inconsistent in their information processing strategies as reflected by larger differences within subject variance. It appears that the opposite of this is applicable for the self-pacing test. When older patients were able to monitor and self-determine the amount of time taken for making a response they performed in a more consistent pattern, suggesting more regularity in their information processing strategies.

This conclusion is also plausible for the findings of the self-pacing simple computation test. The old old patients worked significantly slower but demonstrated less variability in a three minute period. Regarding the stimulus-paced DRT test, the intersubject variability was comparable among the three; if anything there was a slight age-related decline. In addition, it appears that the combination of increased task complexity plus stimulus-paced results in a disproportionate slowing for the 61-70 year olds in comparison with the other two age groups. This suggests that the young old take more time to study and monitor the disjunctive stimuli in comparison with the presentation of single stimuli.

These fingings do not occur with those previously reported (Canestrari, 1963; Arenberg,1965; Monge & Hultsch, 1971). These reports explored the notion that older commmunity residents perform poorly in quickly paced tasks because of the response time limitations rather than "studying time" limitations with serial learning as well as with the paired-associate tasks. Age-related deficits were attributed to stimulus pacing factors. The present findings indicate that in both types of pacing tests, age-related performance decrements are found. However, stimulus-paced tests appear to increase intersubject variability and self-pacing tests decrease this variance.

This implies that older patients, especially those in their eighth decade of life, work slower but also more constantly. Rabbitt (1965) views this as a slightly more cautious approach/strategy employed in self-pacing tests, i.e., the older work more within their capacity

than at their limits - as regards to optimum speed of performance compatible with high levels of accuracy.

In summary, the phenomenon of age-related behavioral slowing in terms of speed of response and information processing was investigated by measuring two types of reaction times tests and two types of continuous performance tests. These psychometric instruments tap forms of behavior mediated by the CNS rather than by peripheral mechanisms. The direction of the findings on both the psychomotor and performance tests support the notion that with advancing age there is a slowness in response patterns and performance rates. Findings, however, do not sustain the concept that the response times and performance rates show disproportionate slowing or a decrement due to a function of age as the complexity of the task was increased. Rather, the age-related differences were explained in terms of impaired efficiency in initiating responses, and not because of impairment in triggering a decision and computing a response. This information was teased out by inspecting the mean differences and ratios between the simple and complex tasks. Since these analyses yielded no significant differences, it is concluded that age-related differences in the area of decision making process are not evident for this sample of institutionalized patients.

With regards to information processing strategies, it is concluded that all age groups benefit from practice and demonstrate positive transfer, indicating similar increases in cognitive organization. Additionally, it is seen that it is more advantageous for the old old to work in situations which allow them the opportunity to

monitor and self-determine their own pace. This results in less productivity but, more important, more regularity in their performance output.

In closing, explanations are offered as to why there was not the expected disproportionate lengthening of response times with advancing age as the complexity of the task increased.

1. It appears to be methodologically unsound to devise expectations regarding the changes occurring in the decision-making components of DRT and ADD in institutionalized elderly patients based upon studies conducted with non-institutionalized elderly persons. The significant differences in the various cognitive, affective, social and health functions further verify the irrelevancy of formulating assumptions for this sample when the reference is another distinct population.

2. The various sensory, central, and motor mechanisms occurring during psychomotor and continuous performance tests work not in isolation but as a complex interacting system. Age changes in any one mechanism may have widespread indirect as well as more obvious direct effects (Welford, 1980). Consequently, being institutionalized may have many contributing causes, and effect some mechanisms more than others.

It is concluded that the main factors limiting psychomotor and performance ability among the institutionalized aged seem to lie in the sensory and motor mechanisms. These effects, in turn, overshadow those attri-

buted to the central mechanisms. These events are explained in terms of the high incidence of physical disabilities manifested by institutionalized elderly persons.

Applicability of the Psychomotor and Performance Findings

It is recalled that 53% of the IWH sample successfully completed the battery of performance tests. In addition, this sample differed significantly from the other segment in terms of functional competency. These points, plus the fact that there is a scarcity of empirical studies designed and executed with the similar aims in mind, restrict one in drawing inferences regarding the appropriateness of these findings and the generalization of them to other institutionalized samples.

It is apparent that in terms of mean responses and standard deviations the sample is quite distinguishable from elderly community volunteers (see Table 11, p. 74). Scores of institutionalized elderly patients cited by Ferris et al. (1976) and Klinger et al. (1976) indicate similar descriptive statistics, and both authors reported that their samples responded approximately 50% slower than did the control groups. Realizing that the evidence is meager, it is nevertheless concluded that the performance results are applicable for samples who manifest a similar degree of functional competency.

Major Findings of the Longitudinal Study

The aim of this section of the study was to investigate the changes that may occur over time in the institutionalized elderly in relation to behavioral observations

of general institutional functioning and to behavioral processes mediated by the CNS. Four possible alternatives were present. The patients could either: (a) continue to deteriorate, (b) demonstrate stability of functioning, (c) exhibit some improvement or (d) fluctuate in functioning over time. Regarding behavioral observations it was hypothesized that there would be age-related decrements and that during the two years of observation, groups would either continue to deteriorate or manifest stability. Likewise, similar hypotheses were advanced for the performance tests, i.e., with advancing age there would be a slowness of response, a decrement in performance, and all age groups would manifest a decline in performance over time. The effects would be best documented by analyzing the changes occurring from the baseline measurements through the post evaluation. Any changes would reflect, to a great extent, the effects of the intervening months of institutionalization.

Behavioral Rating Scales

The major findings of the longitudinal study with regards to the behavioral rating scales were as follows:

1. Significant age-related differences regarding general institutional functioning were obtained on the nurses' ratings but were not present on the doctors' ratings. Doctors did, however, differentiate among the three age groups in terms of their clinical global impression. In both instances the young old were assigned ratings indicating more functional impairment in comparison with the middle old and the old old groups.

2. Significant time effects (ANOVA) were not found on either the nurses' or the doctors' ratings. Pair comparison from one MP to the next, however, yielded a significant decrease in the functional competency from the end of the first year to the end of the second year on the nurses' ratings.

Regarding the factor age, doctors and more so nurses noted age-related differences. The direction of these disparities concurred with one another, but the degree of differentiation was more observable among the nurses' ratings. The direction of these findings, however, was not expected. That is to say, it was not assumed that the young old would be viewed as functioning at a slightly lower level of competency in comparison with the other two age groups. Rather, the reverse was expected based upon the concept that the raters would be influenced by the health status of the elderly, namely the age-related incidence of disease and disability, and likewise by common myths and stereotypes applied to the elderly (Bulter, 1975; Karasu et al., 1979). It is noted, though, that these discrepancies were not present at the two year post evaluation.

These findings obviously do not support these notions. Instead, it appears that other factos may be operative which in turn influence the judgment of the raters. In searching for an explanation, it is speculated that nurses and doctors may also assign ratings in the context of age normative patterns and social stratification (Neurgarten & Hagestad, 1976). For example, when considering the life course, emphasis is placed upon time tables. Individuals develop a mental map of

the life cycle; they visualize that certain events will occur at certain times. Therefore, it is possible that nurses and doctors consider it more age-appropriate for someone in their seventies or eighties to be institutionalized. In turn, they view them as operating more within their capacity, and in comparison with the 61 - 70 year olds, they ascribe them slightly higher ratings.

Concerning the factor time, it is apparent that the age group patterns on both sets of ratings do not support the notion of a continuation of decline in behavioral functioning. Rather, as judged by the data, the majority of patients regardless of their age either gave evidence of stability or manifested fluctuating patterns in the quality of their behavioral functioning over the two years of observations. In addition, a smaller number showed either improvement or deterioration. In terms of behavioral variability, doctors viewed more patients as maintaining their plateau over the period of observation, whereas nurses perceived more patients as manifesting undulating patterns. Apart from these small discrepancies, the sets of ratings complemented one another.

Part of the findings were expected, i.e., the stability of behavioral functioning. It was also estimated that a slightly larger percentage of patients would have demonstrated signs of continuating deterioration, but it was not assumed that such a large percentage of patients would manifest fluctuations from one MP to the next. Fortunately, there have been a few studies addressing similar issues which together provide additional perspectives and information about the develop-

mental courses of institutionalized elderly persons. And, like the present study, they dealt only with the findings obtained from the survivors. It is noted, however, that the reports (Brody et al., 1975; Kleban et al.,1976) described their samples as mentally aged people.

Brody et al. (1975) and Kleban et al. (1976) reported that the percentage of patients showing decline was matched by those who gave evidence of stability. For example, in Kleban's study, 37% demonstrated a decline in behavioral functioning and an equal percentage remained stable over the two years of observation. The rest of the sample either exhibited marked behavioral variability or showed improvement. They concluded that for many patients either their functioning stabilized or their decline eventually reached a plateau. These trends, they contend, characterize the developmental course of survivors in institutionalized settings. Survival, in the sense of remaining in the study, was in itself associated with functioning at a more optimal level in comparison with those who drop out, regardless of the reason.

These developmental patterns partially describe the trends manifested by the IWH longitudinal sample. Apart from the segment which manifested stability, an equal percentage of patients had a marked amount of behavioral fluctuations over the two years of observations. Such variability implies the influence of many factors on functioning, probably both of internal and external natures.

Judging from these behavioral observations, it is concluded that more patients demonstrate either stability or variability than decline over time. Such findings contradict the view that institutions have deleterious effects on the functional capacities of the residents. In other words, using the behavioral observations as the criteria of evaluation, changes which occur from the baseline measurements through the first and second year post evaluation may be interpreted as being, to a great extent, the result of the intervening months of institutional life. This approach provides information regarding behavioral changes occurring in relation to institutionalization.

The effects of institutionalization in relation to age appear to be fairly systematic. When analyzing the changes from the baseline measurement to the post evaluations, it is apparent that all three age groups maintained or slightly improved the degree of their behavioral functioning during the first year of observation. At the second year evaluation the trends of developmental courses were in the direction of decline. However, in comparison with the baseline measurements, only the middle old manifested indications of deterioration.

Thus, it is concluded that for this selected sample the effects of living in an institution are not detrimental on general levels of behavioral functionings. Such findings argue in favor of the explanations for institutional effects cited by Tobin and Lieberman (1976). That is to say, it is essential to view the effects of institutionalization in light of selection biases, preadmission effects and the institutional environment

and not interpret them only as the effects of living in an institution.

In summary, the longitudinal findings of the behavioral rating scales do not support the hypotheses that (a) with advancing age there would be more functional incompetency and (b) with the passage of time the group trends would show a pattern of decline. Instead, the findings portrayed the reverse. That is to say, first of all, age differences were the result of the young old receiving ratings indicating more functional incapacities. Secondly, the majority of patients evidenced either stability or fluctuations in behavioral functionings over the two years of observation. Since the changes occurring between the baseline evaluations and the post evaluation reflect, to a great extent, the effects of living in this environment, it is concluded that institutionalization does not have detrimental effects on the well-being of this surviving sample. Rather, its consequences result in stability or variability in the context of general institutional functioning. Such findings imply the influence of many internal and external factors on functioning and suggest that there is much heterogeneity within this homogeneous patient group.

Self-Rating Scales

The major findings of the longitudinal study with regards to emotional states as assessed by self-rating scales were:

1. No significant age differnces in terms of state anxiety, mood depression and life satisfaction were obtained.

2. Likewise, no significant time effects were found among these variables. There was, however, an increase observed for the young old in mood depression after the six month test interval.

It is recalled that emotional states were assessed on only two occasions, with the time interval between them being six months.

Regarding the factor age, it is apparent that emotional states do not vary substantially as a function of age for this sample. Results of other studies (McDonald & Spielberger, 1980; Patterson & Spielberger, in press) substantiate these findings. In addition, in comparison with community elderly residents (McDonald & Suchy, 1980; Tobin & Lieberman, 1976) the reported levels of state anxiety, mood depression and life satisfaction were visibly different. It is surmised that these negative emotional states reflect the actual state of being of the institutionalized elderly patients.

With regards to the factor time, in terms of state anxiety and mood depression, it does not appear that living in an institution is associated with increased negative feelings of high anxiety and depression. Spasoff et al. (1978) and Tobin & Lieberman (1976) both reported after one year that there was little net change in these states. Even though there was not a lessening of these feelings, it is rather clear that they are still existing as well as the accompanying negative consequences. Thus, institutionalization, per se, should not be considered the sole cause of these states; rather it should be viewed in combination with the patients' status before and during the process of becoming institutionalized.

Additional explanations as to why these states are heightened among the institutionalized may be extrapolated from the writings of Bischof (1976). In reporting about the normal elderly person, he implies that these states, especially life satisfaction, are nebulous feelings and perhaps more retrospective than perspective. In addition, the responses to such questionnaires are based upon an inventory of a person's biological, psychological, and sociological state of being. Assuming that these patients were also aware of their state of being and that they formulated their responsses in the same manner, it is logical that they would express having more emotional disturbances and discomfort.

It can be concluded that the factor age plays a minimal role in explaining the response patterns of institutionalized elderly persons with regards to their emotional state of being. Likewise, being institutionalized does not aggravate nor improve these states. Rather, it appears that the heightened emotional states reflect the patients' present state of being.

Performance Tests

The major findings of the longitudinal study with regards to the various psychomotor tests were as follows:

1. Significant age differences were consistently obtained at the various MP on both series of SRT and DRT. On the SRT series, the differences were attributed to the augmented response times of the old old in comparison with the other age groups.

On the DRT series, the differences were accounted for by the similar prolongations of response times by both the middle old and old old in comparison with the young old.

2. Significant time changes were not found on either the SRT or DRT over the two year test period. There were, however, slight increments noted on SRT throughout the first year, whereas on DRT these increments persisted throughout the second year.

3. There was almost always a shortening of SRT from the first series to the second series of signals among the three age groups at each of the five MP. This transfer effect was not present from the first to the second series of signals on DRT; instead, there was hardly any change.

4. The intersubject variability on SRT and DRT in terms of age differences and time changes displayed no consistent pattern. Regarding intrasubject variability, approximately 50% of the sample was erratic, whereas the rest demonstrated some time of regularity throughout the two year study period.

Psychomotor tests. The longitudinal SRT findings suggest that with advancing age there were slight increments in response times on both series of signals. Even though these age differences were not symmetrical from one MP to the next, they were consistent in the sense that the young old always registered the shortest RT and the old old the longest RT. These findings support the notion that with advancing age individuals on an average show a tendency towards a slowness in response.

From the longitudinal development of SRT patterns, it can be seen in the first year of the study a slight tendency towards augmentation occurred for all three age groups. At the second year there was a slight reduction in response times for all age groups, but in comparison with the baseline values there was on the average a 6% increase in SRT. From the longitudinal perspective, the response patterns do not support the concept of a continuation of decline in the ability to maintain a state of functional readiness. Rather, as judged by the data, it appears that the developmental course for many patients reflected either some type of consistency or fluctuations in their ability to maintain a state of preparedness over the two year study period. This consistency in responding was slightly more pronounced among the old old, suggesting that they are working more within their capacity than at their limits (Rabbitt, 1965).

The longitudinal DRT findings indicate that there were age differences but that the increases were not proportionate from one age group to the next. Rather, it appears that the additional steps involved in DRT tax more the middle old and old old in comparison with the young old. These findings do not sustain the idea that as the requirements of the RT task are increased, there will be a proportionate or disproportionate lengthening of the response times with advancing age.

Shifting the focus onto the longitudinal development of DRT patterns, it can be seen that the age group trends reflect a high stability of performance. The middle old and old old maintained their level of performance throughout the two year study, whereas for the young old

there was a mild to moderate tendency towards increased RT and variability. In comparison with the baseline values, the young old scores lenghthened 11% and 18% at the first and second year evaluations, respectively. As assessed by these trends, it appears that the developmental path for patients 71-80 and 81-90 years is a combination of stability in performance and fluctuations, whereas for the 61-70 year olds the course suggests more of a mixture of prolongations and inconsistency in response patterns to DRT stimuli.

Differences between SRT and DRT longitudinal findings and patterns are evident in terms of training or transfer effects as measured by comparing the two series of signals. As can be seen during the first year of the study all three age groups facilitated their SRT, but this improvement was not so observable at the two year testing period. Such changes were not apparent on the DRT findings. It appears that all patients, regardless of their age, are at an advantage during the first year in SRT tests because of the simplicity of the test, i.e., since signal and response are both known in advance, the occurrence of a signal initiates a previously prepared response and the accumulating training effects. This facilitation is not observable a year later apparently due to the longer retesting interval and the lack of practice in the intervening period. Whereas the intervening variables involved in the DRT test appear to inhibit the process of facilitation. However, the longer test interval did not result in a decrease in the level of psychomotor performance.

Part of the findings were expected, namely the age-related decrements in SRT. It was also assumed that similar patterns would characterize the DRT findings and that the age group trends would demonstrate increments in response times over the two year study period. Unfortunately, the lack of comparative studies limits one in providing additional perspectives and reasons for these findings.

Drawing from the findings and explanations of the cross-sectional study, it appears that the same interpretations are appropriate for these findings regarding the factor age. The significant age-related decrements in SRT and DRT reflect, to a greater extent, impaired proficiency in the psychomotor and sensory mechanisms involved in the chain of events occurring during RT performance. The age-related changes which were expected to occur in the decision-making components of DRT are apparently surpassed by the deficiencies in the sensory and motor mechanims and offset by the increased variability within the young old age group.

Judging from the longitudinal development of psychomotor performance, it is seen that most patients either maintained their regularity in response patterns or manifested varying degrees of oscillations from one MP to the next. Such trends appose the premise that living in an institution would have detrimental effects on the behaviors tapped by these psychometric tests. It is recalled that changes occurring from the baseline measurements to the post evaluations are interpreted as being, to a great extent, the result of living in the institution or the effect of institutionalization.

The above longitudinal RT findings support the established phenomena that with advancing age there is a tendency towards a slowness in response which reflects a basic change in the speed with which the CNS processes information. They do not, however, substantiate the concept that if the requirements of the RT task are increased, thereby involving a higher level of the CNS (Birren, 1974), there would be a disproportionate slowing with age. In addition, the examination of these phenomena over a two year period provides a glimpse into the relationship between institutionalization and the aging process in the CNS as measured by these instruments. These brief exposures suggest that the intervening months of institutional life are not detrimental to these processes but by the same token are not beneficial. Rather, it appears that this interaction produces either neutrality or variability.

The major findings of the longitudinal study regarding the continuous performance and the other performance tests (memory, mental status, and progressive matrices) were as follows:

1. Significant age differences were obtained at the three MP on the continuous addition performance test. The differences were the result of the lower mean rates obtained by the old old in comparison with the other age groups.

2. Significant time effects were not found over the one year test period. There were, however, similar decrements obtained on the middle old and old old performance patterns at the second testing period. These performance rates, however, returned to the baseline values at the last MP.

3. All three groups demonstrated learning effects throughout the test periods at each MP. These curves were more pronunced for the young old and middle old.

4. There was a marked amount of performance variability. Approximately 28% improved their performance output from one MP to the next, and an equal percentage had a U-shaped performance pattern. An additional 25% maintained their level of performance and the remaining 20% showed a decline in performance.

5. Significant age differences were obtained on both short-term and long-term memory (recall) tests. In both instances the 71-80 year olds recalled more objects than did the 81-90 year olds. No significant age changes were obtained on the recognition tests, and likewise there were no significant time changes. There were, however, significant age x time interactions on the recognition memory test. At the post evaluation period, the young old and middle old recorded an 11% increase, whereas the old old registered an 11% decrease.

6. No significant age differences or time changes were obtained on mental status.

7. In terms of fluid intelligence no significant age differences were found.

Continuous performance test. The longitudinal findings of the continuous performance test suggest that the old

old were more impaired in this type of test in comparison with the other age groups, who paralleled one another. It appears that the functions involved in this ability test, e.g. process of retrieving appropriate number associations and of continuous monitoring, are more taxing on the old old. Such patterns do not support the concept that in tests involving perceptual fluency, decision speed and number facility, there would be proportionate decrements in ability with advancing age. Rather, it appears that age-related deficiencies or in this particular test only begin to become evident in patients eighty years and older. Nevertheless, even though these patients take more time when making a response, they work in a more consistent pattern. That is to say, they work more within their capacity than at their limits.

By the same token, it appears that the young old and middle old benefit more from the training effects occurring in this test. Such transfer effects provide evidence that they are better able to organize, monitor and process the information, whereas the old old execute such procedures at a slower rate. It is assumed, therefore, that a deficit in cognitive organization, as measured by this test, only begins to surface in the later years of life for this particular sample. With regards to the factor time, it can be seen that the longitudinal pattern of the young old is reflective of stability, whereas the developmental trends of the middle old and old old are characterized by a U-shaped profile. The variability of the three groups, however, remained relatively constant over the one year testing period. It is difficult to interpret why the older two groups manifested a drop-off at the second testing pe-

riod and six months later practically returned to their baseline values. Likewise, no additional information is elicted when inspecting and comparing the developmental trends of the other test variables with these.

The longitudinal findings and trends do not support the assumptions that with advancing age there would be gradual decrements in performance over time. Instead, the results strongly suggest that the components tapped by this continuous performance test remain intact and are not influenced by institutionalization. This is especially evident when the baseline and one year evaluations are compared. Thus, it can be argued that institutionalization does not negatively influence number facility, i.e., perceptual fluency, decision speed, continuous monitoring, and retrieval as assessed by this test. By the same token, age differences occur but are not linear in decline.

A major problem encountered when interpreting these longitudinal continuous performance data is the lack of comparative studies addressing similar issues. Despite this fact, certain theories exist. One popular explanation for inferior learning and increased performance decrements in elderly subjects is that they are simply less involved in laboratory tests, per se, since they have less meaning for them (Botwinick, 1973). The reverse, however, may also be applicable, i.e., improvement may occur since the task at hand is meaningful, stimulating and/or challenging.

As indicated in the preceding pages, the analysis resulted in two salient points: (a) the old old performed significantly slower and (b) all three age groups

improved consistently their mean output during the three minute test period at each MP. As referenced earlier (Botwinick, 1973), the former aspect represented the non-cognitive features of the test and the latter the cognitive aspects of it. In addition, since the test was self-paced, it was possible that such a procedure gave the patients the opportunity to organize and encode the stimuli, thus resulting in what Hultsch et al. (1976) label as an increase in cognitive organization, or learning to learn.

The latter findings suggest that motivational factors related to test situation and meaningfulness may be operative and account, in part, for the positive learning effects. Many nursing home patients spend half their time doing nothing and most of the rest of the time in personal care or socializing (Gottesman & Boureston, 1974). Changes in these daily passive behavioral patterns are, more than likely, well received. The testing sessions in this study offered the patients not only a chance for dialogue with an outsider, but also provided them with entertainment and an opportunity to be actively involved in something. It is assumed, especially since this sample continued to participate, that they perceived the tests and sessions as stimulating, challenging and meaningful. The cumulative product of this interaction may have resulted in the patients' being eager and motivated to perform optimally. It is concluded that such motivational factors were operative and are interpreted as influencing the central mechanisms rather more than the sensory and motor ones involved in this task. It is also argued that such findings oppose the notion that inferior learning or age decrements in elderly persons is

the result of less involvement in laboratory or simulated testing situations. Instead, age differences occurring within this particular sample in this continuous perceptual-motor performance test are explained more by factors of positional sense and motor control than by cognitive mechanisms (Welford, Norris, & Schock, 1969, p. 13).

It is concluded that age differences exist among the sample but that they are not at all proportionate or disproportionate with advancing age. In addition, it appears that the antecedents of these age differences lie, to a great extent, in the sensory and motor mechanisms involved in the test and are not due to central mechanisms. Regarding the relationship between institutionalization and the aging process in the CNS as determined by this continuous performance test, it does not appear that the intervening months are at all detrimental. Patients were motivated and involved during each testing session, and judging from the performance patterns there were no signs of cognitive deterioration, rather, patients maintained their level of performance throughout the study period.

Memory. Discussion is now focused on the primary and secondary memory findings. Age-related differences were found on both tests and were the results of the differences between the number of words recalled by the middle old and old old. In both instances the old old recalled significantly less. The findings are in accord with those in the literature (Craik, 1974), i.e. age differences are observed in STM and LTM when the material to be remembered exceeds the capacity of primary memory (Watkins, 1974). Thus, the findings are

viewed in line with the postulates of Schonfield and Robertson (1966) that with advancing age, deficits in memory are explained in terms of retrieval failure.

With the passage of time, i.e. six months, slight improvements were recorded for the young old and middle old in short-term memory. Such findings argue that in the short-time retention of supraspan material, both the acquisition of material into secondary memory and the retrieval of it from that system do not show decrements as a result of institutionalization. The test re-test findings of the recognition test give additional support to this premise. As noted in this test both the young old and middle old recognized slightly more objects six months later, while the performance rate of the old old deteriorated slightly. It is assumed that the age deficits in memory processes observed for the old old indicate difficulties in both acquisition and retrieval processes. Institutionalization, per se, seems only to negatively influence the acquisition processes in this age group.

The findings do not support the notions hypothesized that age-related performance decrements as well as drops in recall and recognition tests over time would be observed. Rather, as with the bulk of the performance data presented so far, the direction of the findings somewhat contradict the expected trends. By pooling the continuous performance test data and the memory findings, it appears that age-related differences only start to emerge within this selected survivoral sample in the very old individuals. Thus, on these functions, there is not a linear decline associated with aging over the period of observation.

Mental status. Regarding this construct, it appears that at the beginning of the study the middle old were functionally at a slightly higher level. It can be seen at the two year follow-up that no significant changes occurred; in other words the sample maintained their level of functioning. Such findings speak further for the idea that the effects of institutionalization for this surviving sample are viewed either as stabilizing or are considered to be neutral.

Progressive matrices. In closing, a final word is addressed to the coloured progressive matrices' findings. This test is an indicator of fluid intelligence: the process of perceiving relationships, abstracting, and problem solving (Horm, 1975). It is most sensitive to "functional fluctuations" in the output of intellectual activity (Raven, 1965). In terms of these parameters, the three groups did not differentiate from one another. Even more striking is the fact that these findings clearly showed no age-dependent changes in the field of fluid intelligence. Simply stated, fluid intelligence is thought to reflect functioning of neurological structures and is tied more closely to biological functioning competencies (Cattell, 1963; Horn, 1970, 1975; Horn & Cattell, 1966). The basic hypotheses predicted age-related decline in fluid intelligence in advanced years and subsequently have been supported (e.g., Cunningham et al., 1975; McDonald & Suchy, 1980; Raven, 1965; Rudinger, 1976; Savage et al., 1973).

Unfortunately, there have not been reported studies addressing the same question, i.e., the relation of age and fluid intelligence with institutionalized patients.

Judging from these findings, it can be argued that for this particular sample there is a similarity regarding biological functioning competencies as measured by CPM. Granted, nine of the 34 patients in the 81-90 year old group did not participate, and it is therefore possible that this selective dropout could have altered the findings. Nevertheless, it is concluded that age differences within this sample in terms of fluid intelligence are not present.

Major Findings of the Survivors and Nonsurvivors, and Length of Hospitalization

The main findings of the study regarding survival were as follows:

1. Within two years after baseline assessments, 57% of the patients evaluated at MP I were dead.

2. Approximately 45% of the nonsurvivors completed the psychological tests at MP I, as did 67% of the survivors.

3. Significant differences between the two groups were found on the nurses'(NOSIE) and doctors' (GRS) behavioral ratings, on both SRT and DRT, as well as on the two continuous performance tests. In each instance survival was associated with better behavioral functioning, shorter simple and disjunctive response times, and higher mean performance rates.

The findings on correlates of survival in institutionalized settings generally correspond to those of previ-

ous studies (Brody et al., 1972; Brody et al, 1975; Dastoor et al., 1979; Epstein and Simon, 1969). The present findings are in agreement with those investigators who found decisive differences between survivors and nonsurvivors in terms of the level of physical and social functioning and the speed with which the CNS processes information, as measured by these psychometric tests.

In short, it appears that the level of functional competency/incompetency at baseline evaluations is of importance in predicting survival/death for elderly institutionalized patients. In other words, patients who possess the abilities to perform adequately on behavioral parameters mediated by the CNS and are viewed as functioning on a more competent level appear to survive longer in institutionalized settings.

The main findings of the study regarding length of hospitalization were as follows:

1. The median length of stay of patients evaluated at MP I was approximately 2 years; 35% of them had been hospitalized for less than a year and 29% of them had been there over three years.

2. A slightly larger percentage of patients who had been hospitalized over three years completed the psychological tests in comparison with the other patients who had been hospitalized for a shorter duration.

3. No significant differences were found on either the behavioral rating scales or the performance

tests due to a function of the length of hospitalization.

These findings are generally not consistent with those reported in the literature (Tobin & Lieberman, 1976; Weinstock & Bennett, 1971). Weinstock & Bennett (1971) reported that newcomers (hospitalized less than one year) perform better on tests of cognitive ability, and such findings are best explained by a "disuse" model of cognitive functioning - if cognitive skills are not put to use, they tend to be forgotten. In addition, newcomers are forced to learn the role of being a new member, and this is best acquired through a process of daily interaction and communication. This exposure to stimulating social learning experiences positively influences cognitive performance. They postulated that after one year of residence the oldtimer status is achieved, which results in less initiative in social roles and relationships, and in turn negatively affects performance on a test of cognitive functioning.

Tobin & Lieberman (1976) imply that only the most intact patients survive the first year after admission. Through the first year, and more so the first six months, patients must learn their new environment. This is perceived as a period of unrest and uncertainty, and it is also a time when they must learn to adapt, accept and adjust to the new setting. Successful adaptation, measured after one year, would be reflected in areas of functional capacity (self-care) and cognitive adequacy (Tobin & Lieberman, 1976).

The above two theoretical points of view do not concur with one another. The former advocates more or less

the detrimental consequences of institutionalization, while the other implies somewhat the reverse. The latter authors point out, however, that the institutions they studied represent the best of the facilities for long-term care of the elderly (Tobin & Lieberman, 1976, p. 200). The IWH findings promote neither theory. Judging from the data, it can be seen that length of hospitalization neither negatively nor positively influences the levels of physical and social functioning and behavioral processes such as speed of response and processing information.

In other words, the performance scores of the newcomers do not reflect better cognitive ability, nor do the behavioral ratings suggest they are experiencing more difficulties in social interactions and in performing activities of daily living. Likewise, the scores of the oldtimers warrant similar interpretations.

However, by separating the newcomers, oldtimers and old oldtimers (over 36 months) into nonsurvivors and survivors, certain trends emerge. Patients who had been living longer at the IWH prior to the start of the study, and who were still alive at the conclusion, were functioning on a more competent level and processing the information at a higher speed. Nonsurvivors, on the other hand, in relation to the length of hospitalization, were functioning on a more incompetent level and processing the information at a slower pace, thus indicating that the degree differentiating the functional competences between nonsurvivors and survivors dilates over time.

In summary, it appears that the assessment battery was sensitive in discriminating between nonsurvivors and survivors. As indicated by the data, the combination of greater incapacities in self-care and social interactions plus psychomotor and performance deficiencies was a predictor of nonsurvival.

Limitations of the Longitudinal Findings

A major aim of this study was to examine the relation of institutionalization and the aging process in the CNS among elderly patients. Inherent in such endeavors are numerous limitations which impose restrictions on the generalizations and inferences that will or may be drawn. It is necessary, therefore, to highlight them, and it is desirable to view the longitudinal findings with these points in mind.

Selective subject attrition. A main problem in longitudinal research is selective subject dropout. That is to say, not all individuals remain equally available for retest due to death, relocation, and failure to cooperate at retesting sessions; it is mainly the ones who are available, thus providing the investigator with increasingly biased samples for examination as the age of the sample subjects increases (Riegel, Riegel & Meyer, 1967; Riegel & Riegel, 1972). Botwinick (1977) implies that in longitudinal studies people who perform poorly tend to be less available for longitudinal retesting than those who perform well. Thus, as the longitudinal study continues over time, superior-performing older people remain in the study and this may obfuscate the findings and minimize age differences (Botwinick, 1977). In other words, the

longitudinal findings may reflect changes among those people available for retesting, but do not accurately reflect changes of more complete populations.

In the present study, within a span of two years, the original tested sample (N: 220) was reduced considerably - 70%. The leading reasons were refusal to participate further (N: 56; 26%) and death (N: 53; 24%). Comparisons of patients who dropped out and survivors did not reveal noticeable age and sex distributions. Likewise, in terms of functional competency as measured by behavioral observations and performances tests, no discernible differences were found. Such findings allow one to assume that the subsamples are largely comparable. Taking it a step further, the results obtained for the longitudinal sample could be generalized somewhat to include the original sample. By the same token, one should exercise caution when applying this reasoning due to subject attrition, and heed the advice of Rudinger & Schmitz-Scherzer (1976) that the overall comparability of subsamples "in no way reduces the possibility of systematic differences between them in regard to the various dependent variables under study; that is, it is possible for something like a 'selection process' involving psychological variables to take place" (p. 15).

Suitability of tests. Generalizations regarding the effects of institutionalization are also dependent on the methods employed. Numerous investigators advocate that one of the appropiate means to evaluate changes for this particular sample are behavioral observations via clinical rating scales (Gottesman & Bourestom, 1974; Guy & Cleary, 1976; Honigfeld, 1974; Kleban

et al., 1976; Plutchik et al., 1970; Salzman et al., 1972; Smith, 1979). On the other hand, the use of these scales is subject to errors of central tendency and leniency errors (Anastasi, 1976) as well as being modified by the raters themselves (see Anastasi, 1976, for review). Bearing these factors, it is concluded that rating scales are sensitive instruments in depicting changes over time.

More controversial is the assessment of change via psychomotor and continuous performance tests. The main debates center around the speed and perceptual-motor functions involved in these tests. Some argue that changes may be a function of a deficit in peripheral sensory and motor functions, and are not attributed to central mechanisms. Others, as referenced extensively in the preceding sections, stress the significance of the slowing of response speeds in later life. The consensus is that the performance decrement part of the classic "normal" aging pattern is not attributed to peripheral noncognitive factors, but to cognitive ones mediated by the CNS. However, it should be remembered that the present sample does not come under the rubric "normal representative samples." In addition, it is highly possible that the more subtle changes in sensory mechanisms and in motor coordination for this particular sample tend to create more variance and influence the test performance behavior more than would be found within "normal" elderly samples.

Research design. The basic paradigm in this longitudinal research asked the question whether change in dependent variables could be explained as a function of institutionalization. The typical pretest-post test

model was used, and it was assumed that if a change in the dependent variables occurred it was due to a function of institutionalization. That is, the behavior of a sample of patients was compared at different points in time and it is inferred that changes which occurred may be interpreted as being, to a great extent, the result of the intervening months of institutional life. Such a design, as well as others, however, is vulnerable to certain sources of internal invalidity. In addition to the ones just described, other threats to the internal validity of this design are given by Campbell & Stanley (1963) and are briefly reviewed (adapted from Schaie, 1977).

1. History. Environmental events happening between the testing sessions may account for the behavior change, e.g., death in the family, an accident or fall. It would have been ideal if the same study were performed parallel with another setting and/or with a control group.

2. Testing. The pretest may have an effect upon performance at post testing, particularly on tests of ability and achievement. It was for this reason that patients were given adaption or training periods before beginning each test. Such effects, known as training or practice effects, are particularly serious over short time periods.

3. Statistical regression. Unless the measurement instruments have perfect reliability, high scores will go down while low scores will go up.

In addition, it cannot be overlooked that the findings are based upon a two year period of observation, during which time only four to five brief exposures were taken. Admittedly, the sum of these photographs cannot be considered a true replica of the intervening months of institutional life. Rather, they are only tachistoscopic glimpses of these time passages.

Applicability of the Longitudinal Findings

It is apparent that numerous factors were operative during the study, e.g., death, health, ability and interest in being tested. The sum of these factors, despite the fact that the analyses of the subgroups of the tested sample yielded no significant differences, justifies exercising caution when generalizing the findings. More appropriate is that the longitudinal findings "while accurately reflecting changes among these people available for retesting, do not accurately reflect changes of more complete populations" (Botwinick, 1977, p. 591).

In other words, it appears that the study of behavioral changes during a longitudinal study becomes the investigation of the behavioral processes of the retested sample. Therefore, it is imperative to bear in mind that the appropriateness of the longitudinal findings characterize only a small segment of the tested sample and even a smaller proportion of the total IWH population.

A common thread running through the longitudinal findings was that the intervening months of institutional living did not aggravate the functional status of the retesated sample. Rather, this sample gave evidence of maintaining an adequate level of functioning. The

inference established was that institutionalization did not have detrimental effects on the functional capacities of the sample, but it was not implied that this conclusion could be generalized to the other IWH residents.

A REVIEW OF THE STUDY

Institutionalization reflects a fundamental change in a person's pattern of living, particularly the imposition of a lifestyle foreign to the previous one. The conventional view is that long-term care settings have detrimental effects on the physical and psychological well-being of the residents. Research supports and negates this opinion. Lacking, however, is empirical data investigating the relation between institutionalization and (a) behavior processes mediated by the CNS and (b) behavioral observations of general institutional functioning. The present study examined this interaction in an endeavor to shed more light on the aging process among the institutionalized elderly.

The methodology consisted of delineating an entire population of a long-term care hospital via behavioral rating scales and psychometric tests. Both cross-sectional and longitudinal research designs were employed. In total there were five measurement points within a two year period of observation: baseline, four months, six months, 12 months and 24 months later. The inclusion criteria were that patients verbally consent to participate, and that they successfully complete a battery of performance tests. An analysis of variance was computed on the data, and distinctions were made on the results obtained among the young old (61-70 years), middle old (71-80 years), and old old (81-90 years), as well as on the changes in these behavioral processes over time.

The major descriptive findings of the cross-sectional study were as follows:

1. Demography: There were 417 patients between the ages of 61-90. The mean age of the sample was 78.8 years: males - 74.7 years, and females - 79.7 years. Eighty percent of the residents were female. The family status of the females were: 11% single, 12% married, 7% divorced, and 69% widowed; regarding males: 21% single, 24% married, 16% divorced, and 39% widowed. The median number of years of education was eight. The majority of the men were engaged previously in some type of skilled labor, and 40% of the females were housewives. In terms of these variables, the assumption that the sample is largely comparable with other institutional settings is warranted.

2. Physical health: Fifty-three percent of the sample had three or more medical diagnoses, and an additional 27% had at least two diagnoses. Eighty percent were diagnosed as having some type of somatic disorder - predominantly a disease of the circulatory system, e.g., arteriosclerosis and cerebrovascular diseases. One-third of the sample was diagnosed as having some type of mental disorder, and less than nine percent had neurological disorders. An analogy was found between the number of diagnoses given and advancing age. In terms of global bodily health status, 15% of the patients were rated as good, 60% as fair, and the remaining 25% as poor. A negative appraisal of health status was related with advancing age.

3. Basic care: Forty percent of the patients were not having difficulties in basic care and health/nursing services, such as needing help with dressing, washing, eating, etc. On the other hand, 20% were in need of these services on a daily basis, and an additional 30% were practically in the same situation. There was no relation between age and the degree of difficulty the patients were having with these activities of daily living.

4. Mental health: Fifty to sixty percent of the sample were not experiencing difficulties in cognitive functioning, e.g., with memory, comprehension or thought processes. Fifteen percent were considered as having these disturbances all the time, and 15 to 20% most of the time. Emotional disturbances such as being anxious or depressed were not observed in 75% of the patients.

The above mentioned physical and mental health variables as well as the basic care factors were evaluated by the ward doctors and, when warranted, in collaboration with the ward nurses. The AGP scale was employed to document these disturbances. Statistical significances were not computed; rather, this scale was used to obtain a descriptive overview of the sample.

In addition to this assessment, patients were evaluated by the respective ward nurses and doctors, and they were requested to complete a battery of psychological performance tests. Fifty-three percent of the sample successfully completed these tests. The behavioral rating scale findings were analyzed according to a

three factor ANOVA: non-tested/tested, age and sex, and the psychological performance results were analyzed according to the factors age and sex. The significant findings were as follows:

5. Behavioral rating scales: The most sensitive factor in discriminating the nurses' and doctors' ratings was the dichotomy of tested vs. non-tested. Patients who completed the performance tests in comparison with those who did not were perceived as being socially more interactive and more competent in performing activities of daily living. Nurses did not differentiate among the three age groups, whereas doctors associated advancing age with a constriction in social interactions and a decrease in sensory functions. Due to the latter findings it was postulated that doctors viewed these deficiencies as restricting the degree and scope of the elderly's social interactions. Sex-related differences were found, however, because of the small numerical differences between males and females in test scores; these disparities were viewed as being quantitative and not qualitative.

   Based upon these findings, it was concluded that behavioral rating scales are sensitive instruments in distinguishing among long-term care patients varying in the degree of their functional competency. In addition, it was assumed that the utilization of the psychological test battery as a screening device should be recognized as a potential means for estimating the functional competency of institutionalized patients.

6. Psychomotor tests: The direction of the findings on both simple and disjunctive reaction time support the phenomenon of age-related behavioral slowing in terms of speed of response, but argue against the concept that as the complexity of the task increased there would be a disproportionate slowing with age. The differences are explained in terms of impaired efficiency in initiating responses, and not because of impairment in triggering a decision and computing a response. Sex differences were also found on both reaction time tests. Males were always quicker than females on each series of both tests. The results were viewed in the same light as were the age-related findings. It was noted, however, that the females were considerably older than the males, and the sex differences may well be an artifact of the factor age.

7. Continuous performance tests: From the perspective of mean differences, there was a disproportionate decrement in performance rate with advancing age. However, by focusing on the learning rate occurring during the test, all age groups demonstrated similar increments in the performance rates from one 30 second time segment to the next. Since the mean performance rate reflects the non-cognitive aspects of the task, and the learning rate the cognitive aspects, it was maintained that no age-related deficits were found in learning ability; rather, differences observed were in the area of initiating responses. Additional interpretations with regards to the consequences as the complexity of the task increased indicated that no

systematic change was found. This implied that with advancing age there would not be a need for more time to search for, recover, and produce a response. In other words, no age-related differences were found due to a function of retrieval difficulties (the recovery and utilization of stored information).

In summarizing the performance tests findings, an explanation was proposed as to why there were not the expected disproportionate prolongations of response times and decrement in performance ability with advancing age as the complexity of task increased, thereby involving a higher level of the CNS (Birren, 1974). It was pointed out that the three main central mechanisms involved in the chain of events occurring during psychomotor and continuous performance tasks work not in isolation but in a complex interacting system. Age changes in any one mechanism may have widespread indirect as well as more obvious direct effects (Welford, 1968, 1976, 1977, 1980). Consequently, being institutionalized may have many contributing causes, and affect some mechanisms more than others.

It was hypothesized that the main causes of impairment of psychomotor and performance ability among the institutionalized aged lie in the sensory and motor mechanisms. Age-related performance changes attributed to a function of central mechanisms which were expected to be found were apparently compensated for or surpassed, to a great extent, by these mechanisms.

In closing, a word was addressed to the applicability of the cross-sectional findings. It was speculated that the findings were germane and could be generalized to other institutionalized settings. It was postulated that within the IWH as in other institutions the population samples are homogeneous in terms of demographic data and medical diagnoses, but heterogeneous in terms of functional competency as measured by physical, social and physic parameters and processes.

Longitudinal Study

Of the original tested sample, N: 220, 80 patients took part in the longitudinal study and were retested on three occasions within the first year, and 65 of these patients were again re-evaluated and tested one year later. The main causes leading to this reduced sample size were death and unwillingness to continue. Comparisons of dropouts and the survivors did not result in statistical differences in terms of age, sex ratio, and functional competency as measured by the behavioral rating scales and the performance tests. Nevertheless, it was advocated that one should be cautious when assuming the comparability of the subsamples, and cognizant of a "selection process" taking place. More practical would be to consider the following longitudinal study as showing the characteristics of those who survived, rather than viewing them as accurately reflecting changes of the entire tested sample.

The major longitudinal findings were as follows:

8. Behavioral rating scales: Nurses, but not doctors, differentiated among the three age groups, i.e., they assigned the young old ratings indicative of having more functional incapacities. Findings were interpreted in the context of age normative patterns. In other words, since it is more appropriate for individuals in the late seventies or eighties to be institutionalized, they were viewed as operating more within normative patterns, and in comparison with the young old were ascribed slightly higher ratings.

   Regarding the factor time, no systematic changes suggestive of decline or improvement were noted in the longitudinal findings. The majority of patients gave evidence of stability or manifested fluctuating patterns in the quality of their behavioral functioning over the two years of observations. Variations in these assessments from the baseline to the post evaluations were interpreted as being, to a great extent, the result of the intervening months of institutional life. Such findings contradicted the view that institutions would have deleterious effects on the functional capacities of the residents. Rather, it was concluded that long-term care settings did not have either negative or positive consequences on the functional well-being of this surviving sample.

9. Self-rating scales: The levels of emotional states such as anxiety and mood depression did not vary substantially as a function of age for this

sample. Likewise, living in this setting was not associated with an increase in these feeling states. In other words, institutionalization does not aggravate these negative states but also does not ameliorate them.

10. Psychomotor tests: The longitudinal age-related findings coincided with the cross-sectional ones. With advancing age there was a tendency towards a slowness in response which reflects a basic change in the speed with which the CNS processes information. They did not, however, corroborate the theory that if the requirements of the task are increased, the response times of the disjunctive test would be disproportionately slower compared with the simpler test.

The longitudinal development of psychomotor performance revealed that an equal percentage of patients either maintained a regularity in their response patterns or oscillated from one MP to the next. Such trends opposed the premise that institutional living would further retard the behavioral processes tapped by these psychometric tests. It is recalled that the RT measurements were the only variables assessed at every MP. The examination of this parameter over the two year period of observation provided a glimpse into the relation between institutionalization and aspects of the aging process in the CNS. It was concluded that these brief exposures indicated that the intervening months of institutional life were neither detrimental nor beneficial to these behavioral processes.

11. Continuous performance tests: Age-related decrements within this sample began to surface in individuals eighty years and older. Nevertheless, the old old worked more consistently during the three minute testing period at each MP. By the same token, the young old and middle old excelled more in learning ability that the old old. Such transfer effects provided evidence that the 61-70 and 71-80 year olds were organizing, monitoring and processing the tasks at a faster rate.

In terms of the longitudinal patterns, all age groups at the close of the study had equaled the performance they obtained at the baseline evaluations. In other words, institutionalization did not negatively influence the components tapped by this continuous performance test, namely perceptual fluency, decision speed, continuous monitoring and retrieval.

The longitudinal continuous performance results were also discussed in the context of motivational factors related to test situation and meaningfulness. It was speculated that long-term care patients found the testing sessions in contrast with the daily routines to be stimulating, challenging and meaningful. Such motivational factors were thought to be operative and help to explain, in part, the positive performance patterns obtained on the cognitive aspects of this test. Such conclusions conflict with the popular explanation that inferior learning or increased performance decrements in elderly individuals is the result of less involvement in laboratory or stimu-

lated testing sessions, since they are less meaningful for them.

A final word was addressed to the construct "fluid intelligence" as measured by the CPM. Assuming that this particular test does indeed represent biological functioning competencies, it was argued that within this sample no age-dependent changes in the area of fluid intelligence were obtained.

At the conclusion of the study information was gathered on the general mortality rate in this institution. During this time span 57% of the sample passed away. A comparison of the results obtained at MP I between the nonsurvivors and survivors revealed the following:

12. Nonsurvivors/survivors: Approximately 45% of the non-survivors completed the psychological performance tests at MP I, whereas 67% of the survivors did. Decisive differences were found between the two groups in terms of the degree of physical and social functioning and the speed in which they were processing information. Survival was associated with better behavioral functioning, shorter simple and disjunctive response times, and higher mean performance rates. It was postulated that the assessment battery was sensitive in discriminating between nonsurvivors and survivors. The mixture of having greater incapacities in self-care and social interactions plus psychomotor and performance deficiencies were associated with nonsurvival.

In closing, it was suggested that the study of behavioral changes during a longitudinal study becomes the investigation of the behavioral processes of the retested sample. Findings obtained characterize the retested sample and should not be generalized to the entire IWH sample.

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MH 9-39
1-73

NURSES' OBSERVATION SCALE FOR INPATIENT EVALUATION

Honigfeld, G., Gillis, R. D. and Klett, C. J.

INSTRUCTIONS: *Code 20 under sheet number on general scoring sheet.*
For each of the 30 items below you are to rate this patient's behavior during the last THREE DAYS ONLY.
Indicate your choice by marking one response position for each item.

USE A NO. 2 LEAD PENCIL. BE SURE TO MAKE MARKS HEAVY AND DARK. ERASE COMPLETELY ANY MARKS YOU WISH TO CHANGE.

	NEVER	SOME-TIMES	OFTEN	USU-ALLY	ALWAYS
Row 1	5	6	7	8	9
2	5	6	7	8	9
3	5	6	7	8	9
4	5	6	7	8	9
5	5	6	7	8	9
6	5	6	7	8	9
7	5	6	7	8	9
8	5	6	7	8	9
9	5	6	7	8	9
10	5	6	7	8	9
11	5	6	7	8	9
12	5	6	7	8	9
13	5	6	7	8	9
14	5	6	7	8	9
15	5	6	7	8	9
16	5	6	7	8	9
17	5	6	7	8	9
18	5	6	7	8	9
19	5	6	7	8	9
20	5	6	7	8	9
21	5	6	7	8	9
22	5	6	7	8	9
23	5	6	7	8	9
24	5	6	7	8	9
25	5	6	7	8	9
26	5	6	7	8	9
27	5	6	7	8	9
28	5	6	7	8	9
29	5	6	7	8	9
30	5	6	7	8	9
Cols	*6*	*7*	*8*	*9*	*10*

ROW NO.	*Mark each item on row designated in columns 6 -- 10*
1	Is sloppy
2	Is impatient
3	Cries
4	Shows interest in activities around him
5	Sits, unless directed into activity
6	Gets angry or annoyed easily
7	Hears things that are not there
8	Keeps his clothes neat
9	Tries to be friendly with others
10	Becomes easily upset if something doesn't suit him
11	Refuses to do the ordinary things expected of him
12	Is irritable and grouchy
13	Has trouble remembering
14	Refuses to speak
15	Laughs or smiles at funny comments or events
16	Is messy in his eating habits
17	Starts up a conversation with others
18	Says he feels blue or depressed
19	Talks about his interests
20	Sees things that are not there
21	Has to be reminded what to do
22	Sleeps, unless directed into activity
23	Says that he is no good
24	Has to be told to follow hospital routine
25	Has difficulty completing even simple tasks on his own
26	Talks, mutters, or mumbles to himself
27	Is slow moving and sluggish
28	Giggles or smiles to himself without any apparent reason
29	Quick to fly off the handle
30	Keeps himself clean

MH 9 40
1-73

PLUTCHIK GERIATRIC RATING SCALE

INSTRUCTIONS: *Code 20 under sheet number on general scoring sheet.*
Choose one response for each item and record in the appropriate spaces

Row	1	2	3
1	0	1	2
2	0	1	2
3	0	1	2
4	0	1	2
5	0	1	2
6	0	1	2
7	0	1	2
8	0	1	2
9	0	1	2
10	0	1	2
11	0	1	2
12	0	1	2
13	0	1	2
14	0	1	2
15	0	1	2
16	0	1	2
17	0	1	2
18	0	1	2
19	0	1	2
20	0	1	2
21	0	1	2
22	0	1	2
23	0	1	2
24	0	1	2
25	0	1	2
26	0	1	2
27	0	1	2
28	0	1	2
29	0	1	2
30	0	1	2
31	0	1	2
Cols:	*1*	*2*	*3*

ROW NO.	*Mark each item on row designated in columns 1 – 3*
1	**1. When eating, the patient requires:** 0 = No assistance *(feeds himself)* 1 = A little assistance *(needs encouragement)* 2 = Considerable assistance *(spoon feeding, etc.)*
2	**2. The patient is incontinent:** 0 = Never 1 = Sometimes *(once or twice per week)* 2 = Often *(three times per week or more)*
3	**3. When bathing or dressing, the patient needs:** 0 = No assistance 1 = Some assistance 2 = Maximum assistance
4	**4. The patient will fall from his bed or chair unless protected by side rail:** 0 = Never 1 = Sometimes 2 = Often
5	**5. With regard to walking the patient:** 0 = Has no difficulty 1 = Needs assistance in walking 2 = Does not walk
6	**6. The patient's vision, with or without glasses, is:** 0 = Apparently normal 1 = Somewhat impaired 2 = Extremely poor
7	**7. The patient's hearing is:** 0 = Apparently normal 1 = Somewhat impaired 2 = Extremely poor
8	**8. With regard to sleep, the patient:** 0 = Sleeps most of the night 1 = Is sometimes awake 2 = Is often awake
9	**9. During the day, the patient sleeps:** 0 = Sometimes 1 = Often 2 = Most of the day
10	**10. With regard to restless behavior at night, the patient is:** 0 = Seldom restless 1 = Sometimes restless 2 = Often restless
11	**11. The patient's behavior is worse at night than in the daytime:** 0 = Never 1 = Sometimes 2 = Often

PLUTCHIK GERIATRIC RATING SCALE

ROW NO.	*Mark each item on row designated in columns 1 – 3*
12	**12. When not helped by other people, the patient's appearance is:** 0 = Almost never sloppy 1 = Sometimes sloppy 2 = Almost always sloppy
13	**13. The patient masturbates or exposes himself publicly:** 0 = Never 1 = Sometimes 2 = Often
14	**14. The patient is confused** *(unable to find his way around the ward, loses his possessions, etc.)*: 0 = Almost never 1 = Sometimes 2 = Often
15	**15. The patient knows the names of:** 0 = More than one member of the staff 1 = Only one member of the staff 2 = None of the staff
16	**16. The patient communicates in any manner** *(by speaking, writing, or gestering)* **well enough to make himself easily understood:** 0 = Almost always 1 = Sometimes 2 = Almost never
17	**17. The patient reacts to his own name:** 0 = Almost always 1 = Sometimes 2 = Almost never
18	**18. The patient plays games, has hobbies, etc.:** 0 = Often 1 = Sometimes 2 = Almost never
19	**19. The patient reads books or magazines on the ward:** 0 = Often 1 = Sometimes 2 = Almost never
20	**20. The patient will begin conversations with others:** 0 = Often 1 = Sometimes 2 = Almost never
21	**21. The patient is willing to do things asked of him:** 0 = Often 1 = Sometimes 2 = Almost never
22	**22. The patient helps with chores on the ward:** 0 = Often 1 = Sometimes 2 = Almost never

ROW NO.	*Mark each item on row designated in columns 1 – 3*
23	**23. Without being asked, the patient physically helps other patients:** 0 = Often 1 = Sometimes 2 = Almost never
24	**24. With regard to friends on the ward, the patient:** 0 = Has several friends 1 = Has just one friend 2 = Has no friends
25	**25. The patient talks with other people on the ward:** 0 = Often 1 = Sometimes 2 = Almost never
26	**26. The patient has a regular work assignment:** 0 = Away from the ward 1 = On the ward 2 = No regular assignment
27	**27. The patient is destructive of materials around him** *(breaks furniture, tears up magazines, etc.)* 0 = Never 1 = Sometimes 2 = Often
28	**28. The patient disturbs other patients or staff by shouting or yelling:** 0 = Never 1 = Sometimes 2 = Often
29	**29. The patient steals from other patients or staff members:** 0 = Never 1 = Sometimes 2 = Often
30	**30. The patient** *verbally* **threatens to harm other patients or staff:** 0 = Never 1 = Sometimes 2 = Often
31	**31. The patient** *physically* **tries to harm other patients or staff:** 0 = Never 1 = Sometimes 2 = Often

State Anxiety Inventory by Spielberger et al 1970

Name _____	Sex M F	Age _____	Date _____

Directions:
A number of statements which people have used to describe themselves are given below. Read each statement and then check the appropriate box on your answer sheet to indicate how you **feel** right now, that is, at **this moment.** There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

1. I feel calm	not at all ☐	somewhat ☐	moderately so ☐	very much so ☐
2. I feel secure	not at all ☐	somewhat ☐	moderately so ☐	very much so ☐
3. I am tense	not at all ☐	somewhat ☐	moderately so ☐	very much so ☐
4. I feel strained	not at all ☐	somewhat ☐	moderately so ☐	very much so ☐
5. I feel at ease	not at all ☐	somewhat ☐	moderately so ☐	very much so ☐
6. I feel upset	not at all ☐	somewhat ☐	moderately so ☐	very much so ☐
7. I am presently worrying over possible misfortunes	not at all ☐	somewhat ☐	moderately so ☐	very much so ☐
8. I feel satisfied	not at all ☐	somewhat ☐	moderately so ☐	very much so ☐

9. I feel frightened	not at all	somewhat	moderately so	very much so
10. I feel comfortable	not at all	somewhat	moderately so	very much so
11. I feel self-confident	not at all	somewhat	moderately so	very much so
12. I feel nervous	not at all	somewhat	moderately so	very much so
13. I am jittery	not at all	somewhat	moderately so	very much so
14. I feel indecisive	not at all	somewhat	moderately so	very much so
15. I am relaxed	not at all	somewhat	moderately so	very much so
16. I feel content	not at all	somewhat	moderately so	very much so
17. I am worried	not at all	somewhat	moderately so	very much so
18. I feel confused	not at all	somewhat	moderately so	very much so
19. I feel steady	not at all	somewhat	moderately so	very much so
20. I feel pleasant	not at all	somewhat	moderately so	very much so

score

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State of Well - Being Scale -

Befindlichkeits-Skala

Instruction:
Below you will find different words. Please decide – without thinking too much – which of the two words corresponds most closely to your **present** state or the way you feel now. Put a cross in the box under this word. Only if you are completely unable to make a decision mark the box in the column 'neither-nor'. Do not skip any line!

I am feeling now:	more outgoing ☐	more inhibited ☐	neither-nor ☐
I am feeling now:	more in a good mood ☐	more gloomy ☐	neither-nor ☐
I am feeling now:	more lacking in drive ☐	more always on the go ☐	neither-nor ☐
I am feeling now:	more sickly ☐	more healthy ☐	neither-nor ☐
I am feeling now:	more determined ☐	more aimless ☐	neither-nor ☐
I am feeling now:	more serious ☐	more happy-go-lucky ☐	neither-nor ☐
I am feeling now:	more lacking in ideas ☐	more full of ideas ☐	neither-nor ☐
I am feeling now:	more easily hurt ☐	more not easily hurt ☐	neither-nor ☐
I am feeling now:	more pessimistic ☐	more optimistic ☐	neither-nor ☐
I am feeling now:	more carefree ☐	more brooding ☐	neither-nor ☐
I am feeling now:	more worn out ☐	more peppy ☐	neither-nor ☐

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S3 JJ XXIII 36517

I am feeling now:	more able to love ☐	more unable to love ☐	neither-nor ☐
I am feeling now:	more guilty ☐	more guiltless ☐	neither-nor ☐
I am feeling now:	more exhausted ☐	more refreshed ☐	neither-nor ☐
I am feeling now:	more fed-up with life ☐	more enjoying life ☐	neither-nor ☐
I am feeling now:	more good ☐	more bad ☐	neither-nor ☐
I am feeling now:	more merry ☐	more sad ☐	neither-nor ☐
I am feeling now:	more loved ☐	more unloved ☐	neither-nor ☐
I am feeling now:	more lazy ☐	more active ☐	neither-nor ☐
I am feeling now:	more reserved ☐	more responsive ☐	neither-nor ☐
I am feeling now:	more lively ☐	more lifeless ☐	neither-nor ☐
I am feeling now:	more perky ☐	more lacking in energy ☐	neither-nor ☐
I am feeling now:	more attentive ☐	more absent-minded ☐	neither-nor ☐
I am feeling now:	more desperate ☐	more hopeful ☐	neither-nor ☐
I am feeling now:	more contented ☐	more discontented ☐	neither-nor ☐
I am feeling now:	more timid ☐	more adventurous ☐	neither-nor ☐
I am feeling now:	more strong ☐	more weak ☐	neither-nor ☐
I am feeling now:	more well-balanced ☐	more unbalanced ☐	neither-nor ☐
score 1 ☐☐			

SHORT PORTABLE MENTAL STATUS QUESTIONNAIRE (SPMSQ)

Eric Pfeiffer, M.D.

Instructions: Ask questions 1-10 in this list and record all answers. Ask question 4A only if patient does not have a telephone. Record total number of errors based on ten questions.

+	-	
		1. What is the date today?_____ (Month / Day / Year)
		2. What day of the week is it?_____
		3. What is the name of this place?_____
		4. What is your telephone number?_____
		4A. What is your street address?_____ (Ask only if patient does not have a telephone)
		5. How old are you?_____
		6. When were you born?_____
		7. Who is the President of the U.S. now?_____
		8. What was President just before him?____ _____
		9. What was your mother's maiden name?_____
		10. Subtract 3 from 20 and keep subtracting 3 from each new number, all the way down.

_____ Total Number of Errors

To Be Completed by Interviewer

Patient's Name:_____ Date_____

Sex: 1. Male 2. Female

Race: 1. White 2. Black 3. Other

Years of Education:_____ 1. Grade School 2. High School 3. Beyond High School

Interviewer's Name:_____

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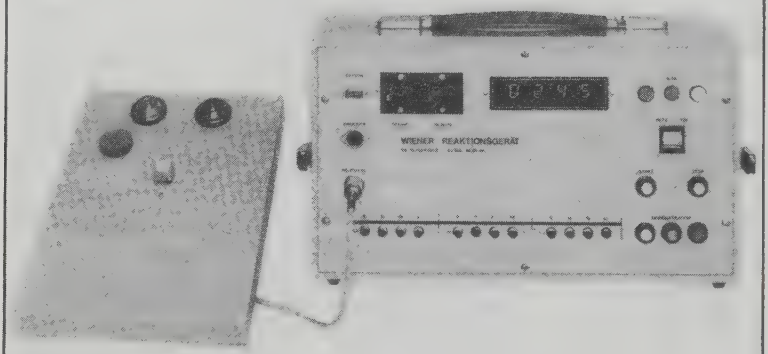
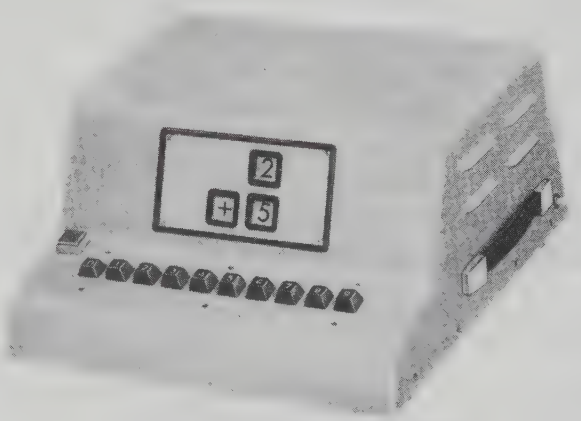
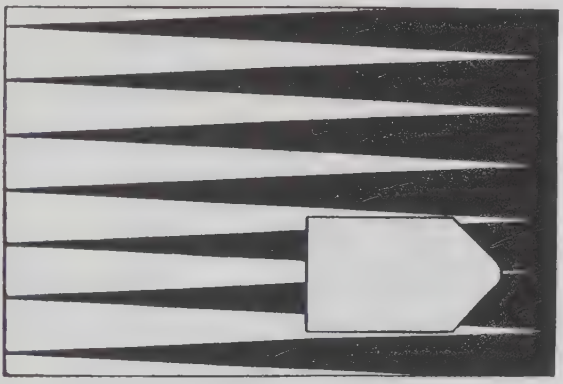
Vienna Reaction Timer

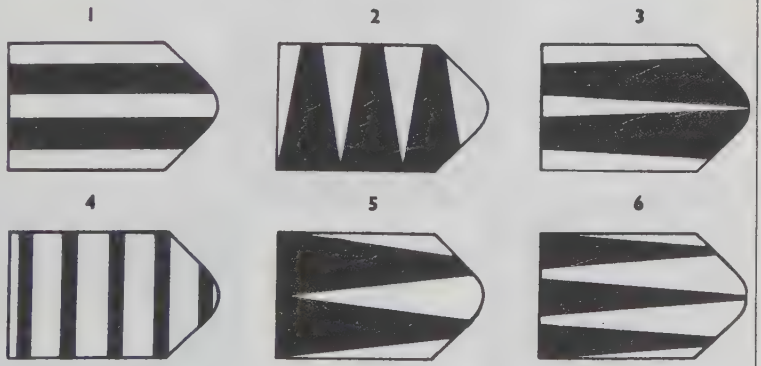


Pauli Continuous Performence Test



Coloured Progressive Matrices





The Visual Memory Test - Syndromkurztest

CURRICULUM VITAE

On September 16, 1947 I was born into the family of Joseph B. and Mary E. McDonald in St.Louis, Missouri, USA. My formative years were spent in St.Louis, Mo. In 1965 I attended Regis College, Denver, Colorado, and in 1969 I received a Bachelor of Science degree in Psychology. Shortly thereafter I began military service and served two years in a military hospital in Okinawa, Japan as a counselor. In 1972 I returned to St.Louis and began working at the Missouri Institute of Psychiatry as a research assistant.

In 1975 I relocated to West Berlin, Germany, and began working for Schering AG in the clinical research division. In 1976 I finished my master's degree and obtained a position on the academic staff of Schering as a research psychologist. Since then I have been involved in geriatric and Parkinson research. In June 1979, I completed in evening school the course work and qualifying examinations for a doctorate program in Human Development and Counseling, School of Education, George Peabody College, overseas program, West Berlin. Likewise, in 1980 I completed my dissertation for promotion to Doctor of Philosophy, Rheinische Friedrich-Wilhelms-Universität, Bonn, West Germany.